federal register

Wednesday
September 24, 1980

Part II

Department of Energy

Office of Conservation and Solar Energy

Residential Conservation Service Program

DEPARTMENT OF ENERGY

Office of Conservation and Solar Energy

10 CFR Part 456

[Docket No. CSA-RM-79-101]

Residential Conservation Service Program

AGENCY: Department of Energy.

ACTION: Final and interim rules.

SUMMARY: The Department of Energy (DOE) is implementing the Residential Conservation Service (RCS) Program pursuant to Title II, Part 1 of the National Energy Conservation Policy Act (NECPA) (Pub. L. 95-619, 92 Stat. 3206, *et seq.*), The purpose of the program is to encourage the installation of energy conservation measures and renewable resource measures in existing houses by residential customers of larger gas and electric utilities and home heating suppliers.

On November 7, 1979, DOE issued a Final Rule for the RCS program (44 FR 64602). Included in the Final Rule were several reserved sections.

A Proposed Rule that filled in these reserved sections and proposed additional sections was published on December 21, 1979 (44 FR 75956) and is made final here. References to "the Final Rule" will refer to the rule published today unless otherwise specified.

This Final Rule establishes requirements for certification of installers and inspectors of flue opening modifications (vent dampers) in gas-furnaces; installers and inspectors of automatic intermittent pilot ignition devices in gas-fired furnaces; installers and inspectors of wind energy devices, and installers and inspectors of active solar space heating systems, solar domestic hot water systems, and combined active solar space heating and solar domestic hot systems. The Final Rule also sets out standards for thermosiphon hot water heaters, standards for solar swimming pool heaters; loading requirements for installation of loose fill thermal insulation; installation standards for caulks and sealants; material standards for pipe insulation; material and installation standards for flue opening modifications (vent dampers); standards for wind energy devices; material standards for automatic intermittent pilot ignition devices; and interim installation standards for automatic intermittent pilot ignition devices.

EFFECTIVE DATE: Section 456.915 shall be effective on an interim basis on October 24, 1980. (see Section III-K for an explanation of the interim basis for this provision); and the remainder of the provisions of this rulemaking shall be effective on October 24, 1980.

ADDRESSES: All reports in this Final Rule are available for inspection in the Department of Energy Reading Room, Room 5B-180, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C., between the hours of 8:00 a.m and 4:30 p.m., Monday through Friday.

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SUPPLEMENTARY INFORMATION:

I. Introduction.
II. Qualification Procedures.
III. Standards.
IV. Regulatory Analysis and Urban Impact Assessment.
V. Environmental Impact Statement.
VI. Consultation with Other Federal Agencies.
VII. Contractor Contributors to the Rulemaking.

I. Introduction

The Department of Energy (DOE) is amending Part 456 of Chapter II of Title 10 CFR to complete the rulemaking requirements for Title II, Part 1 of the National Conservation Policy Act (NECPA) (Public Law 95-619). Several areas in the Final Rule established November 7, 1979, (44 FR 64602) were reserved pending further study and investigation. These reserved sections were proposed December 13, 1979, (44 FR 75956, December 21, 1979), and most are finalized here. Included herein are qualification procedures for installers and inspectors of wind energy devices and furnace retrofit devices. Also included are installation standards for caulks/sealants, vent dampers, automatic intermittent pilot ignition devices (IID's), wind energy devices and solar devices. This also includes material standards for wind and solar devices.

II. Qualification Procedures

The Proposed Rule contained qualification procedures for installers and inspectors of:

- Vent dampers;
- Automatic intermittent pilot ignition devices (IID's);
- Wind energy devices;
- Active solar space heating systems, solar domestic hot water systems, and combined active solar space heating and solar domestic hot water systems.

Few people commented on the substance of the qualification procedures for installers and inspectors of furnace retrofit devices. The American Gas Association (AGA) stated that "* * * DOE should, at a minimum, develop training and testing procedures so that all jurisdictions will be able to judge qualifications on an equitable basis." As part of the technical assistance to those implementing the RCS program, DOE will provide training materials for installers and inspectors of vent dampers and IID's. Training materials include student manuals, teaching aids, and tests, based on the AGA "Manual for Field Service and Adjustment of Gas Space Heating Equipment."

Several utilities requested that DOE specify that a utility cannot be designated as an inspector for furnace devices which operate with a fuel other than that supplied by the utility. These comments were the subject of an earlier rulemaking on the Residential Conservation Service program (see **Federal Register**, November 7, 1979) and are therefore not addressed here. The RCS Final Rule published November 7, 1979, gave the State lead agency responsibility for determining who should conduct inspections of all measures. Utilities and others who have an interest in this issue are encouraged to work with the State lead agency in finding an equitable way of resolving these concerns.

Edison Electric Institute (EEI) submitted to the public docket the results of a survey they conducted of 35 States. EEI found that:

- Thirteen States do not require local code inspections of automatic vent dampers;
- Thirteen States do not require local code inspection of IID's;
- Eighteen States do not require local code inspection of wind energy devices;
- Fifteen States do not require local code inspection of solar domestic hot water systems;
- Fourteen States do not require local code inspection of active solar space heating systems;
- Sixteen States do not require local code inspection of combined active solar space heating/domestic hot water systems.

EEI also suggested that DOE require a local code inspection where it is available "to eliminate or preclude the possibility of dual or multiple post-installation inspections of these

devices." Again this comment is outside the scope to this rulemaking. DOE anticipates that State lead agencies will consider using local code inspection services when practical.

Nine southern gas utilities suggested that all requirements relating to vent dampers and IID's be deleted from the program. They cited evidence from AGA's Space Heating Efficiency Improvement Program (SHEIP) which showed these devices to be not cost effective in warmer climates. They also expressed concern about several safety related items. Specifically:

- Variations in burner, wiring and control configurations make field installation difficult and expensive;
- Field installation of these devices require installation skills and quality control beyond what can reasonably be expected;
- Retrofit installations may void furnace warranties.

DOE agrees with the utilities that vent dampers and IID's may not be cost effective in warmer climates because of the generally smaller seasonal fuel consumption per house. The cost effectiveness of a particular damper installation is dependent upon many things including the type, size, and tightness of house construction; the type and design of the damper; type and size of the furnace; type and size of the venting system; location of the furnace within the house; presence of a gas (or oil) fired water heater or other vented appliance in the same room as the furnace; and local climatic conditions including wind effects. Although DOE does not plan to remove vent dampers and IID's from the list of RCS program measures, we will consider evaluating State-specific applicability criteria described in the State Plan for furnace retrofit devices. Applicability criteria may be such that an auditor can determine in advance whether or not a furnace retrofit device is likely to be cost effective; a State may not, however, simply exclude all vent dampers and IID's from the program. Because there are some homes in all climate regions for which vent dampers and IID's are cost effective, the applicability criteria may not exclude these homes.

Utility concerns about safety include installation problems that may be encountered due to the wide variety of burners, and of wiring and control configurations. These are addressed in § 456.814. The installation skills required of installers and inspectors in § 456.314 should reduce the safety problems addressed by utilities.

Another commenter suggested that it was not necessary for an installer of thermal vent dampers to be instructed in circuitry, electrical vent dampers, schematic diagrams, electrical components, and related areas. DOE agrees that an installer of thermal vent damper does not need to know how to install electrical or mechanical vent dampers; however, he must be familiar with electrical circuitry and components and be able to conduct a complete safety inspection of the existing furnace before commencing to install the thermal damper.

Some vent damper manufacturers felt the qualification criteria for installers were too comprehensive. DOE reevaluated the proposed criteria and determined they were not unreasonable. If DOE, through utility audits, is going to encourage the installation of vent dampers and IID's, we must be assured that there are people available who are capable of conducting safe and effective installations. Qualifying installers through comprehensive training and/or testing appears the most workable approach.

Several State energy offices and utilities expressed the opinion that inspection of wind energy devices was too difficult for State or utility personnel to undertake. They noted more specifically that the wind standards and test requirements are too detailed and complex for States to implement.

As noted in the Preamble to the Proposed Rule of December 21, 1979, DOE intends to provide, as part of its technical assistance to the States, a model qualification program for inspectors of wind energy devices. This technical assistance should facilitate training and qualification of personnel to conduct post-installation inspections of wind energy devices. However, DOE believes that even without this assistance, inspection of wind devices need not be particularly burdensome or difficult to accomplish.

DOE agrees with a commenter's view that installers and inspectors of wind devices need not be proficient in or have a complete working knowledge of the intricacies of the test requirements of the standard. However, DOE believes that it remains beneficial for installers to have fundamental understanding of the tests, their purposes, the significance of results with respect to system sizing and operation, and where the test data may be obtained.

Inspectors should possess a general knowledge of test requirements and purposes in order to most effectively meet their responsibilities. Accordingly, DOE has retained the requirements of the Proposed Rule.

A number of commenters requested that DOE designate a specific organization to be responsible for conducting the wind energy devices post installation inspections, and made suggestions as to the parties most suitable to perform this function. The RCS regulations assign to each State the responsibility for designating the agencies or organizations that are to conduct the post-installation inspections of wind energy devices. DOE anticipates that each State will make this determination and assignment in the manner consistent with the State's overall program of inspection for construction and installation related to residential properties and electrical systems, and finds no compelling rationale for limiting State flexibility with respect to this requirement.

Similar comments and suggestions were received regarding designation of parties most suitable for performing inspections of solar domestic hot water systems, active solar space heating systems, and combined active space heating and solar domestic hot water systems. As discussed above, DOE can find no compelling reason to make such a designation.

There were no other substantive comments received addressing the other requirements for inspectors and installers, of these renewable resource measures nor were there any comments questioning the necessity for these qualification procedures. Therefore, DOE has retained the language of the Proposed Rule for § 456.314 (c) and (d).

III. Standards

A. Background

NECPA requires the Secretary to develop material and installation standards necessary to ensure general safety and effectiveness of the installed material. Included herein are renewable resource material and installation standards for thermosiphon hot water heaters, swimming pool heaters, and wind systems. Also included are energy conservation material standards for pipe insulation, and additonal requirements for material standards for vent dampers and IID's, and energy conservation installation standards for caulks and sealants, for vent dampers and for IID's for gas-fired systems, and loading requirements for loose fill insulation.

B. Thermosiphon Hot Water Heaters

No significant comments were submitted on thermosiphon hot water heaters. The standard is therefore finalized as proposed.

C. Replacement Swimming Pool Heaters

No significant comments were submitted on replacement swimming

pool heaters. The standard is therefore finalized as proposed.

D. Wind Systems

This standard has been developed by DOE exclusively for use within the RCS Program. DOE has continually had a policy of adopting voluntary consensus standards developed by the private sector for use within its programs. However, no such standard exists for residential Small Wind Energy Conversion Systems (SWECS) nor could one be prepared in time to meet the legislative deadlines of the RCS program. This standard is intended to be used as an interim standard until such time as a voluntary consensus standard is developed and accepted by DOE as sufficient for purposes of the RCS Program. Wind energy systems cannot be incorporated as an RCS program measure unless an adequate standard exists.

The goal of the interim standard is to provide for safe and effective operation of residential SWECS, without imposing restrictive or costly requirements which could significantly disrupt industry growth and competition. DOE strongly encourages the small, but developing, wind industry to prepare consensus standards. DOE intends to review appropriate consensus standards, as they become available, for incorporation into the RCS program.

DOE received comments from numerous and varied sources on the proposed wind energy standards (§ 456.705, December 21, 1979). The commentors provided useful, and sometimes detailed, information on elements of the proposed rule. Most comments dealt with technical issues and additions or expansion of requirements. DOE has completed a detailed analysis of those comments with the assistance of the technical staff of the Wind Systems Program, Rocky Flats Plant, the Solar Energy Research Institute and various consultants. A detailed listing of the technical comments and the responses has been documented by the Rocky Flats Plant and is available at the DOE Reading Room. Some illustrative examples follow:

In several cases commentors pointed out errors in the proposed rules. These suggested corrections have been made. For example, the requirement for grounding SWECS (proposed § 456.705 (g)(2)(ii); present § 456.705(f)(2)(vi)) has been altered in response to the comment that the grounding of SWECS is not always appropriate or safe and the formula in proposed § 456.705(f)(5) has been deleted and a definition of "survival wind speed" has been added (present § 456.705(b)(32)).

Suggestions for additions or expansion of the regulation were made by several parties. Many of the suggested additions or expansions of the requirement were incorporated into the standard. For example, the utility is now required to keep copies of inspection reports for five years rather than two years (proposed § 456.705(i)(B); present § 456.705(h)(2)), some additional information must be included on the SWECS label (proposed § 456.705(j)(1)(i)–(vi); present § 456.705(i)(2)(i)–(viii)) and the wind speed testing range has been increased (proposed § 456.705(k)(6)(i); present § 456.705(j)(6)(i)). In some cases, the suggestions were not followed because DOE felt they were inappropriate for a standard, but should be considered elsewhere. Other suggestions were not applicable to the limited scope of the standard.

In addition, numerous parties suggested deletions or reductions in requirements. Many of the comments were on the use of the Raleigh distribution and the method of bins. (The method of bins noted here is a specific analysis technique for accumulating performance data for wind energy systems. See Sandia Laboratories Report SAND 77–1375–1978, "Performance Evaluation of Wind Energy Conservation Systems Using the Method of Bins.") Though the Raleigh distribution does not provide the most representative measure of wind for the whole country, it has been included in the standard in order to provide a credible standard rating system for comparison purposes (proposed § 456.705(b)(17); present § 456.705(b)(20)).

The commenters referred to several potential problems with the method of bins and, in some cases, recommended that other methods be used. DOE has retained the method of bins as the one accepted method (§ 456.705(b)(13)) because it is considered the most accurate and because it is important to establish the uniformity of analysis provided by a single method. The reference to the method-of-bins (See Appendix II) may be obtained from the National Technical Information Service and will be available in the DOE reading room.

Among the issues with policy content is that of the scope of wind standard. DOE received a number of comments from the wind industry, state energy offices and utilities regarding the scope of standards (§ 456.705(a)).

Many commentors requested expansion of the scope of standards, from electric interconnected SWECS, to include additional types of wind energy devices. Several commentors argued that the proposed scope implies a significant deviation from the definition in the Final Rule of November 7, 1979. Another commentor observed that all forms of wind energy devices contribute to energy savings. Several commentors expressed the concern that, as proposed, the scope of standards ignores potentially economic applications employing thermal delivery (such as for direct heating of water for space heating and domestic water) and mechanical delivery (such as for pumping water) as well as electric non-interconnected uses.

In response to these comments, DOE has modified the scope of standards to include electric non-interconnected wind energy devices. The standards now cover all forms of electrical energy development, with the exception of wind energy systems employing battery storage. This exclusion of battery storage is a result of several considerations including those relative to standards applicable to residential battery usage, and the uncertainty concerning generic cost and cost-effectiveness of wind systems employing battery storage.

DOE acknowledges the arguments that the Final Rule definition of wind energy devices included all forms of energy producing systems. However, DOE believes there is not sufficient evidence, at this time, to indicate a nationwide, commercially-established use of non-electric wind systems (such as thermal and mechanical delivery mechanisms) that are potentially cost effective for residential purposes.

It is further noted, DOE used only electric generating wind devices in developing the cost effective zones where wind is a designated program measure in the Final Rule of November 7. DOE acknowledges that electric non-interconnected systems, considered in the analysis for the Final Rule, should be addressed in the final standard and has modified section 456.705(a) in response to these comments.

DOE intends to continue its assessment of the energy conservation impact and cost-effectiveness, as well as commercial readiness, of non-electric wind energy systems for residential use, as well as electric systems employing batteries, and will propose changes to the final standards at the time such assessment warrant changes. DOE wishes to note that individual States can propose the addition of other potentially cost effective wind energy devices as State added measures within their State Plan. Finally, DOE believes that the standards, as promulgated herein, will

assure the safe and effective operation of the majority of cost effective residential wind energy uses.

The standard proposed required performance characteristics to be determined as a result of testing by the manufacturer or a separate testing organization designated by the manufacturer (proposed § 456.705(e); present § 456.705(d) *Performance*). In the Preamble to the Proposed Rules, DOE solicited comments in response to the question: Are reasonable alternatives to permitting manufacturer certification available? DOE noted there that in other areas of standards development, DOE has made known its preference for third party certification.

Only one response to that question was received. A State Energy Office observed that wind systems self-certification by the manufacturer is inappropriate and that third party certification is necessary to insure that there is no conflict of interest. At the present time, it was noted, the pressures on these companies to generate sales could lead to conflict of interest if they are expected to self certify their own products. The State Energy Office also requested that each SWECS model be tested at Rocky Flats before the model is eligible for inclusion within a State RCS Program.

DOE has carefully considered the suggestions and has elected to retain, for the present, the dependence on manufacturer testing, or testing by an organization designated by the manufacturer. This has been done in recognition that DOE has no basis for questioning the integrity of the SWECS manufacturers. Moreover, concerning the recommendation for all wind systems to be tested at Rocky Flats, DOE has previously expressed its preference for third party, independent testing and certification. No such capability currently exists for SWECS within the private sector. DOE is concerned that to rely so heavily on Rocky Flats at this time would prove to be counter-productive to the development of such capability within the private sector.

DOE received numerous comments on the setback limitation of one tower height plus one rotor radius from a property line or a right-of-way for electrical transmission or distribution lines (proposed § 456.705(g)(1)(i)). The great majority of the commentors felt that this setback requirement was too severe, and would restrict the use of wind devices under RCS for the majority of middle income housing and older neighborhoods. Several commentors questioned the basis on which the setback requirement was established, stating that there was no substantial empirical basis for the kind of tower failure provided for in the proposed setback requirement.

One commentor requested an increase in the setback requirement and two commentors voiced a strong concern for the electrocution potential inherent in contact between a falling tower and an electric power distribution line. Responding to this same concern, a commentor suggested reduced setback requirements of at least one rotor radius plus five feet from the property line or right-of-way for overhead electric distribution or transmission lines.

Several commentors suggested that DOE delete the setback requirement; and instead, require manufacturers to demonstrate the structural capacity of their systems to be adequate to withstand the most severe forces expected, with an acceptable factor of safety.

Many commentors suggested that a setback provision was inappropriate in the standard and should be left within the domain of local codes and ordinances. One commentor requested DOE to remain silent on the issue of setback until industry consensus standards are finalized.

DOE believes that provisions for setback are appropriate for inclusion in the standard in order to assure non-interference with neighboring and utility property and to assure safety of the wind device owner and others. DOE has sought a substantial empirical basis with respect to tower failure and could find no such basis. The proposed setback requirement was predicated on the most severe potential tower failure, i.e., a tower falling from its base; and reflected the DOE concern to err on the side of safety assurance. Since it could find no substantial evidence that a wind device tower, installed according to the other provisions of this standard, will fall from its base in the manner provided for in the proposed setback, DOE has changed this provision in the final setback requirement. (Present § 456.705 (f)(1)).

In response to comments regarding the restrictive nature of the proposed setback, DOE investigated further the extent to which local codes and ordinances contain setback provisions appropriate to the SWECS application. Based on a sample of local codes and ordinances in urban and rural regions of eight States, DOE concludes that very few local setback provisions deal expressly with wind devices. Setback ordinances are normally established to provide access and assure non-interference with neighboring property or utility service lines, and are not primarily concerned with safety. The sample data revealed that local setback requirements vary greatly within a local authority and from one locality to another. Because of these varations and limitations, DOE believes that use of local property setback codes and ordinances alone, can not provide a basis for assurance of safety. The provisions of the standard are intended to fulfill this need where local codes are not specific to wind energy devices.

§456.705(g)(1)(iii)(B) of the proposed standard established that the local utility would be responsible for determining that existing as well as new utility-owned protection devices would ensure safe utility operation with the additional generating capability created by the SWECS. One commentor questioned who should be required to pay for new utility system protective devices, if such are needed.

Relative to proposed § 456.705(g)(1)(iii)(C), three commentors raised the issue of responsibility for damage to the utility system, to the user, or to other customers, resulting from an interconnected wind system. Recommendations included: the SWECS owner should be responsible for any damage to the utility system; the utility should not be liable for any damage caused by the SWECS interconnect; the owner is liable if the utility is not informed of the interconnect. Commentors requested a specific assignment of such responsibility in the Final Standard.

With regard to utility required electrical tests prior to interconnection, called for in proposed § 456.705(g)(1)(iii)(G), several commentors requested clarification of who should bear the cost of such electrical tests. Commentor's opinions varied, some proposing the customer should pay for the tests and some proposing the utility pay for such tests.

In response to these several sets of comments, DOE acknowledges that the issues of payment for new utility system protection devices and the assignment of liability for damage to a utility or its customers as a result of a SWECS interconnection, are not resolved in the Rule. DOE believes that these are issues to be resolved by the appropriate State utility regulatory authority in consultation with the State RCS Lead Agency.

Since DOE believes that questions of cost to comply with utility requirements for interconnection are an issue to be resolved by the appropriate State agencies, the words "at a reasonable expense" have been removed from the final standard in order to clarify this position.

E. Material Standard for Urea-Formaldehyde (U–F) Foam Insulation

We have not yet finalized § 456.810, "Standard for urea-formaldehyde foamed-in-place insulation" because our consultation with the Consumer Product Safety Commission (CPSC) is still under way. DOE will make a determination on the issuance of this standard and publish regulations reflecting that determination shortly.

F. Material Standards for Pipe Insulation

Only two comments were received on pipe insulation. One commenter stated that the standard was not necessary. DOE has determined, however, that standards are necessary for all insulation materials, including insulation used on pipes. The other suggested that the requirement for a 25-flame spread on exterior facings of organic cellular pipe covering be deleted since there are no separate facings and since it is not a requirement of HH–I–573B. DOE agrees that there should not be a separate requirement for exterior facings, and that the requirement for flame spread rating of 25 may be excessive. Because the area covered by pipe insulation is so much less than that which covers ducts, water heaters, ceilings, walls, or floors, the fire safety requirements need not be as stringent. Accordingly, the Final Rule requires a flame spread rating of 150 for pipe insulation in its end-use configuration when tested in accordance with ASTM E–84.

G. Additional Requirements for Vent Dampers and IID's

The Proposed Rule required an electrically operated vent damper or a thermal vent damper with electrical connections to be installed only where the *specific* wiring diagram supplied by the vent damper manufacturers showed the device to be compatible with the appliance. If wiring or interconnection diagrams duplicating the heating system were not supplied by the vent damper manufacturer, the installation should not be attempted.

Four commenters supported the requirement that installations not be permitted unless a schematic diagram is available. One commenter said it may not be possible to provide a wiring diagram for some furnaces because of their age. One commenter stated that the schematic diagram requirement was unworkable and unnecessary and would limit the number of dampers installed. One damper manufacturer reported that seven wiring diagrams would cover 95 percent of potential applications for their dampers. Three commenters objected to DOE's requiring a schematic to be provided by thermal damper manufacturers. One commenter recommended that suppliers of mechanical dampers supply specific interconnection diagrams showing how their product is interconnected with the motive force and appliance control circuits. Two commenters opposing the requirement for schematic diagrams said that the competent installer would not require specific wiring diagrams. One commenter said a multitude of control circuits exist in the field which can only be dealt with by supplying typical diagrams.

As a result of these comments appropriate revisions have been made to the wording of the Final Rule in order to clarify DOE's intentions. Damper manufacturers are not required to supply *specific* interconnection or wiring diagrams for each and every furnace model. Instead, the damper manufacturer is only required to furnish a wiring diagram which is representative of the type of furnace wiring encountered by the installer in a particular damper installation. If none of the representative diagrams furnished by the damper manufacturers match the actual furnace wiring found by the installer, the damper is not to be installed.

This prohibition against installing dampers without matching wiring diagrams is not applicable to those thermal or mechanical dampers which have no electrical tie-ins. Manufacturers of mechanical dampers must supply a diagram showing how the damper ties into the motive force and appliance control system.

One commenter pointed out that DOE had mistakenly referenced ANSI Z21.20–1979 for the IID standard. Because the standard applies only to OEM (original equipment manufacturer) devices, the standard is not applicable in the context in which it was used. DOE acknowledges the mistake and has changed the reference to the proposed ANSI standard for "Automatic Intermittent Pilot Ignition Systems for Field Installation" as is referenced in § 456.915 for installation standards. The proposed ANSI standard is based primarily on the present ANSI IID standard for OEM devices (Z21.20–1979), with several specifications added to provide for the design and installation differences of these field installed systems including:

(1) a listing of the components required to be part of each system;

(2) a stipulation that when the system is connected to the controls of the appliance on which it is installed, it shall not adversely affect the operation of the appliance;

(3) specifications for proving the pilot before main burner gas flow is allowed and for automatic shut off of both main and pilot burner gas when flow is allowed and for automatic shut off of both main and pilot burner gas when the heating cycle is completed;

(4) specifications for designating wire colors in electrical diagrams;

(5) a homeowner's information manual including operating instructions, information that the appliance has been so modified and recommendations to call a qualified service person for repairs and to have an annual inspection; and

(6) two exhibits, one outlining procedures for the safety inspection of an existing appliance installation and the other for installing the IID.

The same commenter also suggested that DOE reference the October 1979 draft of the proposed ANSI standard rather than the September 1979 draft since only editorial changes were made. After reviewing the two drafts, DOE accepted the suggestion.

H. Loading Requirements for Installation of Loose Fill Thermal Insulation

Eight commenters claimed they had never experienced a loading problem, that the proposed regulation was unnecessary, and that it was discriminatory. U.S. Gypsum recommended increasing the suggested loads to 2.2 psf for all gypsum board configurations. This, they stated, was not based on product research or testing, but simply on what they knew to be acceptable.

DOE has deleted the table of maximum suggested loads, although the provision relating to structural damage has been retained. The table was not a requirement in itself and was included only as guidance in determining if loads on ceiling materials might be exceeded. DOE recognizes that the values in the table were unnecessarily conservative and has deleted them to avoid confusion since many interpreted the values as a mandatory requirement.

However, DOE also recognizes that separation of finish materials from wall studs sometimes occurs during the blowing process. Therefore the provision (minus the explanatory note) remains.

I. Interim Installation Standard for Urea-Formaldehyde Foam Insulation

We have not yet finalized § 456.909, "Standard practice for the installation of urea-formaldehyde foamed-in-place insulation" because our consultation

with the Consumer Product Safety Commission (CPSC) is still underway. DOE will make a determination on the issuance of this standard and publish regulations reflecting that determination shortly.

J. Installation Standard for Vent Dampers on Gas-Fired Systems

One commenter stated that DOE should develop standards which all manufacturers must meet. Other commenters urged that DOE refrain from such action and instead work within the existing standards making process. The American Damper Manufacturers Association (ADMA) said that ANSI and Underwriters Laboratories, Inc. (UL) have already issued damper standards after many years of effort. They claimed these standards have been used to install over 500,000 dampers in the past 2 years without any known accidents. ADMA also said that DOE should not develop additional regulations unless it can be shown that the existing regulations are inadequate.

Another commenter stated that if there are shortcomings to the existing standards, ANSI should be allowed reasonable time to take corrective action. Another commenter said that DOE's extension of the standards (beyond the schematic diagram requirement which is desirable) contradicts DOE's policy of relying upon voluntary consensus standards. Moreover, consensus standards are easier to update and modify than DOE standards. One commenter noted that the damper standard Z21.66 does not contain installation requirements.

DOE concurs that issuance of standards for dampers or other measures is not an appropriate role for DOE so long as there are in existence adequate industry standards. Standards for dampers for gas-fired furnaces and boilers have been issued by the American National Standards Committee Z21. The fact that DOE has adopted these material standards as the basis for the material standard in § 456.814 is an indication of the Department's high regard for the quality of the ANSI standard. This rulemaking should not be interpreted as a rejection of the voluntary standards process.

There were two considerations taken into account. First, the bulk of the requirements set forth by DOE in the Proposed Rule deal with installation procedures. At present, no industry standard known to us sets forth firm and complete requirements governing installation of electrical, mechanical, or thermal dampers.

A suggested installation procedure is included as an exhibit at the back of each of the ANSI standards Z21.66, Z21.67 and Z21.68 covering electrical, mechanical and thermal dampers respectively. In each case the procedure described "is intended only as a guide to aid in determining that an appliance is properly installed." The damper installation procedure included as Appendix 1F of the National Fuel Gas Code is identified as "recommended" and it contains a notice that the procedure is "informative and is not part of the code."

DOE is not issuing an installation standard to compete with voluntary industry standards. In the Final Rule mandatory and complete installation requirements are being included since such requirements were not found in current voluntary industry standards.

Second, the process of revising voluntary standards is not a swift one. Deficiencies in a standard which come to light today may not actually be dealt with until after the lapse of many months. A year or more may sometimes elapse before the necessary revisions to the standard are finally approved. Rather than leaving reported deficiencies to be handled through the voluntary standards process, DOE elected to deal with them in this Final Rule. When appropriate action is taken to correct these deficiencies by the standards organization, prompt consideration will be given to revising the Final Rule.

In the Proposed Rule, DOE described 15 issues involving the scope or content of the installation standard. In nine of the 15 issues, comments were specifically requested. A summary of each of these issues, the comments received, and DOE's response are noted below:

(1) *Exclusion of Steam Boilers.* The proposed standard was applicable to field installation of dampers in gas-fired, forced-air and gravity furnaces and low-pressure not water boilers. Paragraph 456.914 (b)(25) and (d)(14) refer to low-level controls which are more commonly used on steam boilers than hot water boilers. Two commenters called attention to the fact that steam boilers were not mentioned in the "Scope." Dampers for gas-fired steam boilers are not included in this Final Rule because the number of such residential heating plants in use is relatively small (estimated to be less than 1 percent), and the safety problems involved have not yet been investigated in depth by DOE.

(2) *Dampers for Oil-Fired Systems.* DOE stated in the Proposed Rule that vent dampers on oil-fired heating systems are being temporarily excluded from RCS until present studies at Brookhaven National Laboratories (BNL) are completed. Comments were solicited.

Two commenters objected to exclusion of dampers for oil systems. One said such an exclusion was inconsistent with DOE's stated goal of conservation. The other pointed out that NECPA does not differentiate between dampers for oil furnaces and dampers for gas furnaces. A third commenter said if dampers on oil furnaces are judged not cost effective, a second look should be taken at the cost effectiveness of dampers for gas furnaces. The commenter experienced "negative cost results" with dampers for gas furnaces. One commenter said BNL tests were not conclusive. BNL found a 5 percent savings for one type of damper installed on an oil-fired furnace with a modern (flame retention head) burner, but a 10 percent savings when installed on a furnace with an "old type" burner.

DOE still maintains that dampers for oil-fired systems may offer smaller savings than dampers for gas-fired systems. No recommended installation procedures have been published by a national standard organization which DOE could use as a basis for preparing detailed and complete installation standards. DOE will not include the dampers for oil-fired systems in the RCS program at this time. They will, however, receive further consideration at a later date. It should be noted that if any State determines that vent dampers on oil-fired systems will contribute to the effectiveness of their program, they could be added under the provisions of § 456.319.

(3) *Water Heater Dampers.* In the Proposed Rule, DOE stated that vent dampers for water heaters were excluded from the program because they are beyond the scope of the program. Furthermore, such installations often do not prove cost effective. DOE also expressed concern about the safety and effectiveness of a water heater vent damper which used the same vent and same combustion air supply as the space heating furnace.

Twelve commenters discussed water heater dampers. None thought the combination concept unsafe. Five thought that adding the damper to the water heater would save energy. One commenter described a test in Texas where a thermal damper on a water heater failed to show an energy savings. Three commenters pointed out that installing a damper on the water heater increases the level of savings obtainable from the furnace damper. One commenter recommended a well-

instrumented field test to determine the magnitude of the energy savings for the combination. Another commenter suggested that a vent damper be *required* on any gas water heater installed contiguous to a gas-fired central furnace or boiler, claiming that it is one of the most cost effective conservation measures. Two others asserted that water heater dampers were cost effective.

All of the RCS measures are specified in NECPA, Title II, Part 1, section 210. NECPA included as an RCS measure "devices for modifying flue openings which will increase the energy efficiency of the heating systems. . . ." Although DOE does have authority to add other measures to this list as appropriate, we determined not to do so until after the RCS program was initially implemented. To add measures before program implementation would entail extensive evaluation of over 100 energy conserving products suggested during the RCS comment period, as well as standards development for many of them. In addition, as measures are added to the program, audit costs increase. DOE did provide States an opportunity, however, to add State-specific measures in their State Plan (see § 456.319). This means that States may include water heater dampers as a State measure in the RCS program if the requirements of § 456.319 are met.

DOE did not mean to imply in its earlier statement that *all* vent damper installations on water heaters are not cost effective. Installation costs for various kinds of dampers vary widely. The cost effectiveness of dampers on water heaters appears to depend upon installation cost, type of damper, and on location of the water heater. Water heaters located in areas essentially at outdoor temperatures will not benefit significantly from a vent damper.

(4) *Dampers for LPG Systems.* DOE stated in the Proposed Rule that liquified petroleum gas (LPG) systems were excluded because of the additional safety problems associated with such systems. Six commenters addressed this subject, all expressing the view that LPG appliances should be treated the same as natural gas appliances. In other words, dampers for LPG appliances should not be excluded from the RCS program. The commenters appeared to believe that the installation of a damper on an LPG appliance did not present a safety hazard greater than installation of a damper on an appliance burning natural gas supplied by a utility.

LPG is heavier than air. It remains DOE's view that with LPG the possibility of gases collecting around appliances and creating a hazardous condition is greater than with natural gas which is lighter than air.

DOE believes some mixing and diffusion of leaking LPG gases would occur and, therefore, that the vent system would carry off at least some of the leaking LPG. A closed damper with perhaps a 10 percent open area does cause a very small but real reduction in the draft available to remove leaking gas. DOE maintains that this reduction in draft is acceptable in the case of natural gas. DOE is as yet unconvinced that the draft loss is acceptable in the case of LPG. Accordingly, DOE will exclude dampers for LPG appliances from the RCS program until such time as test data by impartial authorities is presented to demonstrate that LPG gas leakage is adequately vented through the appliance draft hood with the vent damper closed.

(5) *Draft Hood Spillage Check To Be Performed Only When Outdoor Temperature Is Above 65°F.* Because vent capacities are reduced when the differences between indoor and outdoor temperatures are the least and wind velocities are low, DOE required in the Proposed Rule that all checks of venting capacity or draft hood spillage be conducted when the outside temperature is above 65°F and the wind velocity is less than 10 mph.

The proposal was challenged by 15 commenters generally expressing the view that the requirement was unrealistic, impossible or impracticable, unenforceable, expensive and unreasonably burdensome. In the colder regions of the country, installation would be precluded in fall and winter when the savings potential is the highest. Three commenters predicted that the 65° temperature restriction would limit installations to such an extent that contractors would no longer be interested in installing dampers. One gas company expressed the opinion that homeowners, required to wait many months for warmer weather necessary for the prescribed spillage test, may lose interest in the measure. Scheduling of inspections within a one week time interval after installation will often be impossible if the date of the installation cannot be established in advance, but is instead determined by the weather.

In explaining why the proposed warm weather spillage test was unnecessary commenters offered these arguments:

(a) In the open position, a vent damper conforming to the ANSI standard, does not reduce vent temperature nor restrict the effective draft by a significant amount.

(b) Conditions other than outdoor temperature are more likely to result in insufficient draft or spillage.

(c) When the furnace venting system inspection is made at temperatures well below 65°F, the year round adequacy of the venting system can still be assured. The methods identified by commenters included:

(i) Comparing design and dimensions of the venting system with the requirements of the National Fuel Gas Code.

(ii) Adoption of a SHEIP [1] technique for evaluating draft in warm weather from data collected in cold weather (without specifying what this technique included).

Several commenters stated that if the 65°F temperature restriction is imposed for damper installations, it should logically also be imposed whenever furnaces or vent systems are modified or replaced. One commenter carried this a step further by explaining that replacing a furnace would involve more risk than retrofit installation of a damper. The new furnace, if it has a higher rated output than the old furnace, would probably result in increased loading of the vent system. It could also result in lower temperatures of the vent gas as a result of more excess air, more dilution air or higher efficiency. They recommended changing the minimum permissible outdoor temperature to 40°F. One damper manufacturer recommended reliance upon a damper spill switch. Another damper manufacturer recommended a damper incorporating a draft detector.

It appears that the 65°F damper spillage test was interpreted by commenters as a test of the damper. Actually DOE intended the test primarily to check the adequacy of the existing venting system.

In the report "An Assessment of Retrofit Automatic Vent Dampers for Residential Heating Systems" published November 1977, Arthur D. Little, Inc., concluded that an inspection program prior to installing vent dampers in existing heating systems will result in a small decrease in the number of heating system-related accidents occurring each year. Because the installation of vent dampers entails the addition of a device in the venting system and in the safety control system, vent dampers could be expected to result in increased accidents. However, the inspections preceding damper installation will bring to light deficiencies in some of the existing furnace control systems and venting systems. Some of these deficiencies, if left undetected and

[1] The Space Heating Efficiency Improvement Program (SHEIP) was developed by the American Gas Association to demonstrate the effectiveness of various furnace modifications in increasing furnace efficiency.

uncorrected, would eventually result in injury or death. A. D. Little, Inc., maintained that detection and correction of these deficiences could save more lives than could be lost as a result of damper accidents. To ensure that the net effect of a damper retrofit program is a reduction in the frequency of total accidents, it is important that field inspections of heating systems and venting systems be carefully performed by testing the existing vent system under conditions most likely to result in spillage. The 65°F outdoor temperature limit is thought to be the most dangerous condition likely to be encountered. Chimney induced draft falls off as the temperature outdoors decreases. A heating system would almost never be called upon to operate when the outdoor temperature rose to 65°F. At outdoor temperatures of 65°F or higher, heat given off by appliances, lights and building occupants, as well as solar heat gain, would maintain indoor temperature in the comfortable range without help from the heating system. It is only when outdoor temperatures fall below 65°F that the heating system is called upon for heat.

DOE acknowledges that the 65°F requirement would unduly restrict damper sales. Clearly what is needed is a sound, widely accepted technique to permit measuring draft at any outdoor temperature (below 65°F) and then converting that measured value to the draft which would result on a 65°F day with all other conditions remaining unchanged. Insofar as can be determined, there is no such technique. DOE has been unable to obtain any material to confirm the suggestion that a technique was developed under the SHEIP program.

DOE in the Final Rule has provided an alternate to the 65°F and 10 mph test requirements. The alternate procedure includes a careful visual inspection of the interior of the entire venting system to ensure that it is free of any obstructions which would impair draft such as fallen chimney mortar or tiles, dead birds, bird nests, crushed metal duct, etc.

In the meantime, DOE would be willing to work with industry groups or others to develop a technique for determining the likelihood of spillage when outdoor temperatures are 65°F or higher using draft data collected when outdoor temperatures are lower than 65°F or to validate an existing technique. At such time as a satisfactory technique is available, DOE will incorporate it into the installation standard.

(6) *Damper and Furnace in Unheated Space.* In the Proposed Rule, DOE excluded from the RCS program installations of dampers on heating systems located in spaces at or near outdoor temperatures such as unheated basements, attics, or crawl spaces with openings to the outdoors.

Three commenters concurred with DOE saying dampers were not cost effective in these circumstances. Commenters from the Gulf states recommended that the damper be excluded from the RCS program in their states because 65–75 percent of the furnaces there are installed in areas which communicate freely with the outdoors. One commenter, however, felt that vent dampers should be permitted in unheated spaces. They claimed effectiveness of the installation would be increased if the damper were to be installed on a boiler or hot water heater. Two commenters questioned whether the term "unheated space" can be properly applied to a basement in which the house furnace is located. In such basements the temperature will be 55–60°F because of the heat given off by the furnace jacket, duct work and piping. The warmer basement will reduce the amount of heat flowing down from the floor above into the basement.

In the Final Rule, DOE has retained the prohibition but explains that the term "unheated space" specifically refers to that which is open to the outdoors. It does not refer to closed basements, rooms, alcoves or closets where the temperature of the space is considerably higher than the outdoor temperature because of heat rejected by heating system and water heater jackets, venting systems, warm air ducts, and piping containing hot water.

(7) *Wiring Diagrams.* The proposed installation standards permitted only those installations where wiring diagrams supplied by the vent damper manufacturer showed the vent damper to be compatible with the existing heating system. Comments received in response to this requirement are discussed in section G.

(8) *Field Test of Actuating Temperature for Damper-Closing Temperature Control.* The standard for electrical dampers (ANSI Z21.66–1977) requires that a damper equipped with a damper closing temperature control shall not be capable of automatically closing when the temperature of the air in the damper is less than 225°F under specified test conditions. A primary failure mode, and the one that the damper closing temperature control is designed to protect against, is an automatic gas valve that sticks open so that gas is flowing even though there is no call for heat. In this case, the damper would be closed and the burner would be firing if a protective device, such as a damper closing temperature control, were not actuated. The Proposed Rule discussed the requirement for checking a temperature control in the field. The "check" consisted of operating the furnace for 10 minutes, then reducing the comfort thermostat to shut off the main burner gas flame. The damper should remain open for a short period of time and then close. In addition, the Proposed Rule required a measurement of the temperature of the gases downstream of the draft hood after the heating system had been in operation for 5 minutes. If this temperature was not above 375°F, the damper was not to be installed. It was calculated that if a temperature below 375° prevailed at normal full firing rate, then the temperature resulting from operation with partially blocked fuel gas flow could be below 225°F. This would not be high enough to actuate the device which prevents damper closure if the gas valve were stuck open.

The American Gas Association (AGA) objected to the 375°F temperature requirement because in some instances it would preclude electric dampers capable of meeting the 225°F requirement of the ANSI Z21.66 standard from being installed. AGA also pointed out that ANSI Z21.66 does provide a performance test requirement for the damper closing device and there is no reason why the damper should receive further testing in the field.

One commenter questioned DOE's conclusion that a 375° vent gas temperature at full burner output ensures a temperature higher than 225° at lesser burner outputs. However, no data to support this challenge was furnished.

DOE considers it essential to verify that a damper with a damper closing temperature control will remain open at the lowest vent gas temperature which could be encountered in the field. A vent gas temperature below 225°F could prevail in the case of a furnace installation having a large dilution air flow such as would result from a high chimney, large chimney diameter, large draft hood and/or high efficiency furnace. If installed on such a furnace, a damper just meeting the 225°F test requirement of paragraph 2.7 of ANSI Z21.66–1977 could cycle open and closed or even remain closed with the furnace in operation and dangerous spillage from the draft hood could result if the automatic gas valve malfunctioned in the open position. The danger of spillage due to a closed damper is increased if there is a partial reduction in the flow of fuel gas to the main burner, such as would result from a gas valve which

failed to close completely. Under such conditions the temperature of the combustion products entering the damper is reduced.

By requiring a vent gas temperature of 375°F or more at full fuel gas flow, DOE is assured that the temperature of vent gases will remain above 225°F for the majority of hazardous leaking fuel valve conditions.

While this requirement may well disqualify some dampers for some installations, sound safety considerations require that the requirement be retained.

Similarily, DOE considers the operational check of the damper closing temperature control as installed to be necessary as verification of proper operation. This requirement is also retained. DOE notes that the simple test specified is easily and quickly performed.

(9) *Redundant Gas Valves for Thermal Dampers.* In the Proposed Rule, DOE required the addition of a second automatic gas valve on each furnace where a thermal damper is to be installed. The requirement was established because DOE feared that if the original valve failed to close tightly, the temperature of the gas reaching the thermal damper would be insufficient to cause it to open an adequate amount and spillage might result at the draft hood.

Ten responses were submitted on the second gas valve requirement. Nine who opposed the requirement said that it was unnecessary, unwarranted, and would increase overall costs to such an extent as to compromise cost effectiveness of thermal dampers. One commenter claimed that the total cost for installation of the valve was $130. Another said the valve increased overall cost of the damper installation by 60 percent. The excellent safety record of thermal dampers in recent years was cited as proof that the valve was unnecessary. One commenter said that there was no room in the furnace vestibule for the second gas valve. Another commenter said in some parts of the country a different contractor must be called in to install the second valve encumbering the damper installation beyond the expected benefits. Some commenters also felt that installing the second valve would not make thermal dampers safer. They argued that:

- The redundant valve will not prevent all potential sources of reduced rate gas flow. Other sources include—
  (a) partially blocked burner orifice;
  (b) reduced supply line pressure;
  (c) defective regulator;
  (d) dirt in gas line.
- When the thermal damper is fully closed, the 10 percent remaining open area is more than sufficeint to carry off any leakage of unburned gas.
- If fuel gas is entering the furnace at a fraction of the full load rate and burning there, the thermal damper will not remain in the closed position but will open in response to whatever vent gas temperature rise actually occurs.
- Existing thermal dampers certified by AGA as complying with ANSI standard Z21.68–1978, begin to open at and remain open at a lower temperature than do electric dampers.

Two commenters discussed the hypothetical thermal damper which would not begin to open until the temperature approached 370°F. Both were of the opinion such a design would not be approved as complying with the ANSI standard because the feature would be judged inconsistent with reasonable concepts of safety. Another said it was unlikely that a damper would be designed to "snap" open as the 370°F temperature was approached, but would more likely be designed to open gradually.

Three commenters suggested that DOE's objectives would be better served by requiring dampers to open at a temperature substantially below 370°. Such a requirement would exclude any thermal damper which failed to open sufficiently at part load regardless of the cause of the part load operation. The German damper standard DIN 33881 Part 1 (1478) requires testing of resistance to flow at 2 settings:

- at maximum rated flow at 200°C
- at 0.5×maximum rated flow at 100°C

This commenter went on to say that on all known types of thermal dampers, the amount of opening is a function of vent gas temperature. The present ANSI standard does not prohibit dampers which do not open at less than the rated firing rates, but consideration is being given to revising the standard to require a test at 200°F ± 5°F vent gas temperature or at 30 percent of the original firing rate, whichever provides a lower vent gas temperature. Under the test condition selected, spillage from the draft hood must not occur.

The AGA Laboratory and Underwriters Laboratories, Inc. (the only nationally recognized laboratories presently active in testing dampers for gas heating equipment) have each provided DOE with information which indicates that they would consider unsafe and would not "list" any thermal damper which would not open sufficiently at temperatures likely to prevail if the gas valve failed to close completely. With such a damper no longer a real possibility, failure of the gas valve to close completely would not pose a serious safety hazard. The Final Rule, therefore, requires that all thermal vent dampers be listed by a nationally recognized testing laboratory. Accordingly, the requirement for the second gas valve will be dropped from the rule.

(10) *Electricity Shut Off Prior to Damper Installation.* In the Proposed Rule, DOE expressed concern about the possibility that the installer may receive an electrical shock if power is left on while he is checking for loose electrical connections, worn electical insulation, etc. Comments were requested on the importance of turning off electrical power prior to installation.

One controls manufacturer pointed out that its own installation instructions require the installer to turn power off initially, then turn it on while certain tests are made and finally turn it off again. Another commenter agreed with DOE that both gas and electricity should be cut off before the damper installation is made but that it is incumbent upon a qualified installer to install the damper in a safe manner. If he does not do so, there are safety problems more serious than shock hazard.

DOE considers it appropriate to include the requirement that electricity be turned off before beginning the damper installation. The electricity shut off is called for by the "Procedure for Installation of Automatic Vent Dampers Devices on Existing Appliances" which is Exhibit B in each of the three ANSI damper standards, Z21.66, Z21.67 and Z21.68. The shut off is also called for by "Recommended Procedure for Installing Electrically Operated Automatic Vent Damper Device on Existing Appliances" which is Appendix 1F of the Addendum and Tentative Interim Amendment to the National Fuel Gas Code ANSI Z223.1a–1978.

(11) *Safety and Effectiveness of Vent Dampers on Water Heater/Furnace Installations Using Same Vent Air.*

This subject was addressed in item (3) above.

(12) *Dampers in Unheated Spaces and Combustion Air from Heated Space.* In the Proposed Rule, DOE requested comments on whether vent dampers should be allowed when installed in an unheated area if combustion air is taken from a heated space. It is assumed that draft hood dilution air is taken from the same heated space. An example of this would be a furnace installed in an "unheated" closet with no vent to the outdoors; combustion and dilution air would come through openings in the closet door which opens into heated living space. The issue was addressed

directly by only two commenters. In both instances, they answered affirmatively.

DOE maintains that if the unheated area is enclosed, its temperature will be higher than that of the outdoors primarily because of heat gain in the space from the heating appliance and water heater jacket, vent systems, warm air ducts and/or piping containing hot water. Under these circumstances, installation of a damper would result in a fuel saving. This is discussed further under item (6). In the Final Rule, DOE has clarified what it means by "unheated space."

(13) *Vent Damper Closing Time.* In the Proposed Rule, DOE asked if vent damper standards should require stricter control on vent damper closing time?

Five commenters responded to the question. None of these recommended that limits be established on closing time. One commenter stated that limits on closing time were unnecessary. A gas utility said closing times were related to efficiency and not safety. Another commenter reported that 3–4 percent reduction in energy savings occurs when a slow closing damper is substituted for a fast closing one. Two damper manufacturers provided information on the closing time for their products.

Since to date no field test data on the effect of damper closing time upon energy savings and safety have been collected by impartial investigators and made available to DOE, the Department has concluded that it would be premature to establish limits on closing times in this Final Rule.

(14) *Inspections After the Initial Post-Installation Inspection.* In the Proposed Rule, DOE requested comments on whether there should be additional inspections after the initial post-installation inspection? In particular, should there be an inspection during the first heating season following installation?

Ten commenters addressed the problem. Three commenters were of the opinion that periodic follow-up inspections should be called for. Five said it was not appropriate to call for such inspections. One commenter raised pertinent questions:

Who would make the inspections?

What would it cost?

Would it be physically and economically feasible?

A utility company pointed out that it had no personnel available with expertise to perform the follow-up inspections.

DOE believes that an annual inspection of furnace, venting system, and damper by a qualified inspector is highly desirable from both the safety and the fuel conservation viewpoints and urges every homeowner to have the inspection performed. It is noted that the "Marking" section of each ANSI damper standard requires that a label be posted on each damper recommending annual inspection of appliance and damper by a qualified installer. Therefore, DOE has included recommendations for annual inspections in the Final Rule. However, DOE has not made annual inspections mandatory since DOE believes that the RCS inspection entity should not be required to do more than one mandatory inspection.

(15) *Damper Closing Control.* One commenter suggests that the term "damper closing control" should be changed to "damper opening control" because the purpose of the control is to hold the damper *open.*

Although this comment has merit, paragraph 2.7 of the ANSI damper standard Z21.66, calls the device "damper closing temperature control." DOE prefers to employ the same identification terms as were employed by ANSI.

(16) *Burner Alignment (Hot Spots on Heat Exchanger).* The Proposed Rule required the installer to determine that burner alignment will not cause hot spots on the heat exchanger. Two commenters discussed this requirement, both saying that such a determination cannot be made in the field.

On the basis of the comments received, this requirement has been changed to require the installer only to look for evidence of burner misalignment.

(17) *Gas Leakage.* The Proposed Rule required that the installer determine that concentrations of combustible gas in the vicinity of a heating appliance are less than 20 percent of the lower explosive limit and that carbon monoxide is less than 50 ppm.

Four commenters addressed this requirement. One commenter said that determination of the concentration of combustible gas as less than 20 percent of lower explosive limit required more sophisticated and expensive test equipment than is in general use. All were of the opinion that there should be *no* combustible gas and *no* CO in the room. If either of these contaminants is detected, the leak should be found and corrected before proceeding with installation of a damper.

In the Final Rule, the language has been clarified to indicate that no combustible gas and no carbon monoxide must be present. The quantitative limits were set forth by DOE only to define the meaning of the terms "no combustibles gas" and "no carbon monoxide." The CO level of 50 ppm was chosen because that is the lowest marking on several CO test instruments in common use. The 50 ppm CO level is also the value which has been established by the World Health Organization as the highest acceptable level for an 8-hour exposure without harmful effect upon human health. The 20 percent of the lower combustible limit figure corresponds approximately to the lowest concentration of odorized natural gas detectible by smell.

The Final Rule permits checking for the presence of unburned gas by smell. The requirement that CO levels must be measured by instrument has been retained.

(18) *Furnace Warranty.* Three commenters suggested that consideration be given to the effect upon a furnace warranty of installing a damper. One furnace manufacturer forwarded a copy of its press release notifying its dealers and other customers that field application of any retrofit device that alters its design for venting combustion products is considered potentially hazardous and may void the warranty.

DOE does not believe that a standard is the proper vehicle for resolving questions relating to liability and warranties. However, DOE is of the conviction that a damper properly installed will have no adverse effect upon the furnace. Indeed it will result in a higher seasonal efficiency for the combined furnace-vent system. Moreover, the inspection of a furnace and vent system, which is a necessary precondition for installation of a damper, may disclose deficiencies and safety hazards requiring correction that may not otherwise have been discovered.

K. Interim Installation Standard for Automatic Intermittent Pilot Ignition Devices (IID's)

DOE included herein an interim installation standard for IID's. The standard is interim because it is based on the proposed ANSI standard for "Automatic Intermittent Pilot Ignition Systems for Field Installation" and, therefore, subject to change. When the ANSI standard is finalized, DOE will reevaluate the need for the interim installation standard.

Only two substantive comments were made regarding the IID standard. DOE asked for comments on the Proposed Rule regarding the absence of a limitation on the voltage or current between electrodes which could result in a startle shock or lethal hazard. A major manufacturer of IID's stated that exclusion of this voltage limitation was probably an oversight in the ANSI

standard. AGA expressed confusion as to why the voltage limitation was of concern. They stated that if the installer failed to install the system in an electrically safe manner "there are safety problems more significant than shock hazard." DOE has not specifically addressed these comments in the installation standard since paragraph 1.2.6 of the standard requires that IID's meet "reasonable concepts of safety" in order to be listed. Absence of a voltage or current limitation which could result in a startle shock or lethal hazard is outside reasonable concepts of safety. In addition, paragraph 1.2.10 of the ANSI standard requires that "All electrical equipment, wiring, and accessories supplied for use with the system shall be submitted for examination." DOE has, therefore, determined that sufficient safeguards exist within the standard to ensure that a lethal hazard does not occur.

L. Installation Standards for Caulks and Sealants

Only two comments were submitted on the Installation Practice for Caulks and Sealants. One stated they were unnecessary; the other that they were necessary. The practice was retained since:

—it did not appear to cause any economic burden;

—it does help ensure more effective moisture control; and

—the Tennessee Valley Authority experience indicates that poor workmanship with contractor installed caulking is relatively common.

IV. Regulatory Analysis and Urban Impact Assessment

The President, by Executive Order 12044, has directed agencies of the executive branch to conduct a Regulatory Analysis of regulations which they prepare that are likely to have a major economic impact. In accordance with OMB Circular A–116, an Urban and Community Impact Assessment should be prepared when the Proposed Rule is a major policy and program initiative. This assessment should be incorporated into the Regulatory Analysis.

DOE determined that the Residential Conservation Service Program, authorized under Title II, Part 1 of the National Energy Conservation Policy Act, was a major action which required preparation of a Regulatory Analysis and an Urban and Community Impact Assessment. Consequently, the Department prepared the two analyses in draft in conjunction with the publication of the Proposed Rule for the RCS program on March 19, 1979 (44 FR 16546). These analyses were finalized for publication in conjunction with the Final Rule which was published November 7, 1979 (44 FR 64602). The final Regulatory Analysis, which incorporates the final Urban and Community Impact Assessment, includes analysis of this Final Rule.

A single copy of the Final Regulatory Analysis may be obtained by writing: Mr. James R. Tanck, Chief, Building Applications and Incentives Branch, Department of Energy, Conservation and Solar Energy, 1000 Independence Avenue, S.W., Room GH–068, Washington, D.C. 20585.

V. Environmental Impact Statement

In accordance with the requirements of the National Environmental Policy Action of 1969 (NEPA), 42 U.S.C. 4321 *et seq.*, DOE prepared an Environmental Impact Statement for the entire Residential Conservation Service Program. The subject matter of this rulemaking was evaluated in the programmatic Environmental Impact Statement. A notice of availability of the Final Environmental Impact Statement (DOE/EIS–0050) was published in the **Federal Register** on November 7, 1979 (44 FR 64602). A copy of the final Environmental Impact Statement may be obtained by writing:

Mr. James R. Tanck, Chief, Building Applications and Incentives Branch, Department of Energy, Conservation and Solar Energy, 1000 Independence Avenue, S.W., Room GH–068, Washington, D.C. 20585.

VI. Consultation With Other Federal Agencies

In preparing this Final Rule, issues and options were reviewed by representatives of the National Bureau of Standards.

VII. Contractor Contributions to the Rulemaking

The following entities have made contributions to this rulemaking.

1. The Solar Energy Research Institute (SERI); Rocky Flats Plant of North American Rockwell; and Science Applications, Inc., (SAI) assisted in the development of the proposed standard for wind energy systems. SERI and SAI also assisted in the development of the thermosiphon hot water heaters and solar swimming pool heaters standards.

2. Calspan, Inc., assisted in the development of the installation standards for vent dampers and IID's and modification to the material standards for vent dampers.

Authority. Part 1 of Title II of the National Energy Conservation Policy Act, Pub. L. 95–619, 92 Stat. 3206, *et. seq.* (42 U.S.C. 8211–8226), Department of Energy Organization Act, Pub. L. 95–619, 91 Stat. 565, *et. seq.*, 42 U.S.C. 7101, *et. seq.*

In consideration of the foregoing, the Department of Energy amends Chapter II, Title 10 Part 456 of the Code of Federal Regulation, as set forth below.

Issued in Washington, D.C., September 4, 1980.

Maxine Savitz,

Deputy Assistant Secretary for Conservation, Conservation and Solar Energy.

1(a). 10 CFR Part 456 is amended by deleting section "456.706 Wind systems installation standards [Reserved]", from the Table of Contents and by revising or adding the following entries to the Table of Contents:

PART 456—RESIDENTIAL ENERGY CONSERVATION PROGRAM

* * * * *

Sec.

456.703 Thermosiphon hot water heaters.
456.704 Swimming pool heaters.
456.705 Wind energy devices.

* * * * *

456.914 Standard practice for the installation of electrically-operated, mechanically-actuated, and thermally-actuated automatic vent dampers for use with gas-fired central furnaces and low-pressure hot-water boilers.
456.915 Interim standard practice for the installation of automatic intermittent pilot ignition devices (IID's).
456.916 Standard practices for installation of caulks and sealants.

1(b). 10 CFR § 456.301 is amended by adding as the last two sentences the following:

§ 456.301 Scope.

* * * Certain standards are incorporated by reference into this Subpart as though set forth in full herein, pursuant to 5 U.S.C. 552(a). Identification, description, and information regarding availability of and future changes to the incorporated standards are contained in Appendix II to this Part.

2(a). 10 CFR § 456.314 is amended by adding paragraphs (b), (c), and (d) to read as follows:

§ 456.314 Qualification procedures for auditors installers, and inspectors.

* * * * *

(b) *Installers and inspectors of automatic vent dampers and automatic intermittent pilot ignition devices (IID's) for gas-fired central furnaces and low-pressure hot water boilers.* The State Plan shall contain procedures to assure that any person or persons installing automatic vent dampers or automatic intermittent pilot ignition devices (IID's) for gas-fired

central furnaces and low-pressure hot water boilers under the circumstances described in the State Plan pursuant to § 456.305 and any person or persons conducting a post-installation inspection of an automatic vent damper or IID pursuant to § 456.313(a) shall have the following qualifications—

(1) Installers and inspectors shall demonstrate an understanding of applicable codes and regulations.

(2) Installers and inspectors shall demonstrate an understanding of gas appliances used in residential buildings, including basic system requirements, components and operation, and shall demonstrate an understanding of potential malfunctions of gas appliances.

(3) Installers and inspectors shall demonstrate an understanding of gas appliance controls and safety controls, including automatic gas valves, limit switches, and thermostats. Installers and inspectors shall also demonstrate an understanding of basic furnace and boiler circuitry, including electrical components, and the use of appropriate meters for testing gas appliance circuitry. They shall also demonstrate an understanding of proper component sequencing and be qualified to determine the compatibility of vent dampers and appliances.

(4) Installers and inspectors shall demonstrate an understanding of the purpose, general structure, and operational systems of vent dampers. They shall also demonstrate an ability to service and install electrical, mechanical, and thermal vent dampers and shall be familiar with the advantages and disadvantages of each type. *Exception.* Installers and inspectors of only IID's need not comply with this paragraph. Nor must installers of only thermal vent dampers demonstrate an ability to service and install electrical or mechanical vent dampers.

(5) Installers and inspectors shall demonstrate an understanding of the purpose, basic system requirements and components, and operation of IID's. In addition, they shall demonstrate practical application in servicing and installing IID's, and understanding of schematic diagrams and potential malfunctions of IID's. *Exception.* Installers and inspectors of only vent dampers need not comply with this section.

(6) Installers and inspectors shall demonstrate: (i) an understanding of types of vents, draft diverters, and heat transfer components; (ii) an understanding of venting theory including ventilation air, dilution air, and vent sizing; (iii) an understanding of venting installation procedures; (iv) knowledge of which installations are prohibited; (v) that they are qualified to perform leak and spillage checks; and (vi) that they are qualified to use instrumentation to measure carbon monoxide and carbon dioxide emissions from gas appliances.

(7) Installers and inspectors shall demonstrate an understanding of proper combustion and proper flame characteristics and shall be familiar with gas piping procedures.

(8) Installers and inspectors of vent dampers shall demonstrate an understanding of the installation standards in § 456.914.

(9) Installers and inspectors of IID's shall demonstrate an understanding of the installation standards in § 456.915.

(c) *Installers and inspectors of wind energy devices.*

(1) The State Plan shall contain procedures to assure that any person or persons installing a wind energy device under the circumstances described in the State Plan pursuant to § 456.305 and any person or persons conducting a post-installation inspection of wind energy device pursuant to § 456.313(a) shall have the following qualifications:

(i) Familiarity with the installation standards for wind energy devices in Subpart G;

(ii) Familiarity with the structural characteristics of wind energy devices;

(iii) Familiarity with national and local codes governing the electrical interconnection between the wind energy device and the residential and/or utility electrical system; and

(iv) A general knowledge of the test procedures described in § 456.705.

(2) The State Plan shall contain procedures to assure that any person or persons installing a wind energy device under the circumstances described in the State Plan pursuant to § 456.305 shall demonstrate proficiency in the installation of wind energy devices, and familiarity with the testing of wind energy devices in accordance with the procedures described in § 456.705.

(d) *Installers and inspectors of solar domestic hot water systems, active solar space heating systems, and combined active solar space heating and solar domestic hot water systems.*

(1) The State Plan shall contain procedures to assure that any person or persons installing a solar domestic hot water system, an active solar space heating system, or a combination thereof, under the circumstances described in the State Plan pursuant to § 456.305, and any person inspecting such systems pursuant to § 456.313(a), shall individually or collectively be knowledgeable about:

(i) The residential construction methods employed in the region and the characteristics of structures that would preclude a safe and enduring solar installation;

(ii) The applicable provisions of the *HUD Intermediate Minimum Property Standards Supplement,* as required in Subpart G;

(iii) The design, operation, installation and degradation of residential hot water and heating systems with which the solar devices will interconnect; and

(iv) The connection of the solar devices into the existing residential systems, including testing for satisfactory performance of the solar devices and the modified system, according to the requirements of the *HUD Intermediate Minimum Property Standards Supplement* as required for the program in Subpart G.

(2) The State Plan shall contain procedures to assure that any person or persons installing a solar domestic hot water system, an active solar space heating system, or a combination thereof under the circumstances described in State Plan pursuant to § 456.305, shall demonstrate proficiency in the connection of the solar devices into existing residential systems, in conformance with the applicable provisions of the *HUD Intermediate Minimum Property Standards Supplement,* as required for the program in Subpart G.

2(b). 10 CFR 456.701 is amended by revising the fourth sentence to read as follows:

§ 456.701 Scope.

* * * Certain standards are incorporated by reference into this Subpart as though set forth in full herein, pursuant to 5 U.S.C. 552(a). * * *

3. 10 CFR, Part 456 is amended by adding §§ 456.703, 456.704 and 456.705 to read as follows:

§ 456.703 Thermosiphon hot water heaters.

Thermosiphon Hot Water Heaters shall be constructed and installed in compliance with the applicable provisions of the HUD Intermediate Minimum Property Standards Supplement, Solar Heating and Domestic Hot Water Systems, 4930.2, 1977 Edition, with the exception of several specific provisions that are inappropriate to this technology. The excluded sections are 5615.4.2 and Appendix A, which present procedures for calculating active solar domestic hot water system performance.

§ 456.704 Swimming pool heaters.

Solar swimming pool heaters employing glazed flat plate collectors or a nonpotable heat transfer fluid to capture and transfer solar energy to the pool water, shall be constructed and installed in compliance with the applicable provision of the HUD Intermediate Minimum Property Standards Supplement, Solar Heating and Domestic Hot Water Systems. 4930.2, 1977 Edition. Solar swimming pool heater systems employing nonglazed collectors and the direct heating of recirculated pool water are exempt from these standards.

§ 456.705 Wind energy devices.

(a) *Scope.* This section establishes the standards for electrical wind energy devices when they are installed or supplied under the RCS program. Only electrical wind devices known as small wind energy conversion systems (SWECS) that do not utilize electrical storage and that meet the standards of this section may be installed or supplied as program measures.

(b) *Definitions.* For purposes of this subpart:

(1) The term "anemometer" means a device to measure wind speed.

(2) The term "anemometer distance constant" means a measure of the frequency response characteristics of an anemometer which is determined by the length of wind run that must pass an anemometer before it indicates 63 percent of the actual amplitude of a step-change gust.

(3) The term "atmospheric test" means the conduct of SWECS testing under natural wind conditions.

(4) The term "bin width" means the size of the wind speed interval (expressed in meters per second or miles per hour, whichever is most appropriate) used in the method-of-bins data analysis technique.

(5) The term "cylinder of projection of SWECS rotor" means the cylinder whose axis is aligned with the wind direction and passes through the center of the rotor, whose cross-section extends 3 rotor diameters upwind of the rotor and 6 rotor diameters downwind of the rotor.

(6) The term "disconnect" means a device or group of devices or other means by which the conductor of a circuit can be disconnected from the source of electrical supply.

(7) The term "electrical ground" means a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

(8) The term "electrical load" means an electrical device which utilizes electrical energy.

(9) The term "electrical utility/user interconnection" means the physical connection of the electrical hardware of the SWECS to the electrical systems of both the utility and the user.

(10) The term "free stream area" means that area in a wind tunnel test section in which the wind speed in the absence of an obstruction is uniform within ±5 percent.

(11) The term "horizontal axis wind turbine" means a SWECS that has an axis of rotation of the rotor nominally in a horizontal plane.

(12) The term "interconnected SWECS" means a SWECS which is electrically connected to the utility system and could feed power back into the utility system.

(13) The term "maximum design SWECS power output," as specified by the SWECS manufacturer, means the maximum power output which could be expected from the SWECS when it is operating within its design operating conditions.

(14) The term "method-of-bins" means a data analysis technique consisting of partitioning the wind speeds observed into a selected number of equally spaced intervals or bins. The average of all SWECS power output values observed, essentially simultaneously with a wind speed value in a given bin, is the power associated with the wind speed at the center of the bin.

(15) The term "normal soil" means a cohesive soil with an allowable net vertical bearing capacity of 4,000 pounds per square foot and an allowable net horizontal pressure of 400 pounds per square foot per lineal foot of depth to a maximum lineal foot of depth to a maximum of 4,000 pounds per square foot. Rock, non-cohesive soil, and saturated or submerged soil are not "normal soil."

(16) The term "power conditioning equipment" means a subsystem of the SWECS used to accomplish electrical compatibility between the wind turbine generator's power output and an electrical load.

(17) The term "power" and the term "power output" for the purposes of this standard mean electrical output of the SWECS as represented by the product of the in-phase voltage and current components, expressed in kilowatts (KW).

(18) The term "power output curve" means a graphical plot of SWECS power output (KW) versus wind speed (meters per second or miles per hour).

(19) The term "projected frontal area" means the profile area of an object as seen from the direction of the wind velocity.

(20) The term "Rayleigh distribution" means an assumed wind speed distribution function which is used for wind energy conversion calculations. The distribution function, based on specified annual average wind speed, is defined by the following equation:

$$F(V) = \Delta V \left(\frac{\pi}{2}\right)\left(\frac{V}{\bar{V}^2}\right) \exp\left[-\frac{\pi}{4}\left(\frac{V}{\bar{V}}\right)^2\right]$$

Where:

F (V)=Frequency of occurrence associated with each incremental wind speed of Δ V centered at V. NOTE: The Distribution function is equal to 8760 (F(V)).

V=The center of the wind speed increment (meters per second/miles per hour).

$\bar{V}$=Annual average wind speed (meters per second/miles per hour).

Δ V=Width of the wind speed increment (meters per second/miles per hour).

(21) The term "rated output" means the power output obtained from a SWECS operating at a given wind speed designated by the SWECS manufacturer.

(22) The term "rotor" means a system of rotating elements that convert the energy in the wind into mechanical shaft power.

(23) The term "rotor-swept area" means the area as seen from the direction of the wind that a rotor would pass over during one revolution.

(24) The term "Small Wind Energy Conversion System (SWECS)" means an electrical wind energy device having a rated output of less than 100 kilowatts, which may consist of such subsystems as a wind turbine generator, a tower and/or structural support equipment, power conditioning equipment and, in the case of interconnected SWECS, interconnect equipment.

(25) The term "SWECS cutout speed" means that wind speed above which the SWECS will no longer produce power under normal operating conditions.

(26) The term "SWECS manufacturer" means the manufacturer of the wind turbine generator subsystem of a SWECS.

(27) The term "SWECS Model" means a SWECS with a specific hardware configuration established by the SWECS manufacturer for fabrication and sale to the general public.

(28) The term "standard annual energy production" means a theoretical

representation of the annual energy (in kilowatt hours), obtained by multiplying the standard mean power output by 8760 hours.

(29) The term "standard foundations and anchors" means structures designed to support the maximum combined dead and live loading expected for normal soil conditions. Pile construction, roof installations, foundations or anchors designed for inundated soil conditions, etc., are not "standard foundations and anchors".

(30) The term "standard mean power output" means a theoretical representation of the power output (in kilowatts) produced by a SWECS based on the following:

(i) Power output curve of the SWECS.

(ii) Wind speed characteristics derived from a Rayleigh distribution at a designated average annual wind speed.

(31) The term "standard operating time factor" means the percentage of the total possible operating time a wind energy conversion system would be producing power based on the following:

(i) The power output curve of the system.

(ii) Wind speed characteristics derived from a Rayleigh distribution at a designated average annual wind speed.

(32) The term "survival wind speed" means the maximum wind speed, as designated by the SWECS manufacturer, at which a SWECS, in unattended operation (not necessarily producing power) is designed to survive without damage to structural components or loss of the ability to function normally.

(33) The term "tower" means a subsystem of a SWECS that supports the wind turbine generator.

(34) The term "towing test" means the conduct of SWECS testing where the SWECS is mounted on a moving vehicle (such as a truck or train flat car).

(35) The term "vertical axis" means a line of reference perpendicular to the plane of the ground.

(36) The term "vertical axis wind turbine" means a SWECS that has an axis of rotation of its rotor perpendicular to the horizontal plane of the ground.

(37) The term "wind tunnel test" means a SWECS test in artificial wind when the SWECS is mounted in a structure designed to control the wind characteristics during the test.

(38) The term "wind turbine generator" means that portion of the SWECS which converts wind energy into electric power, including components such as the rotor, generator and control equipment.

(39) The term "yaw" means the rotation of a horizontal axis wind turbine about its yaw axis.

(40) The term "yaw axis" is the axis about which the directional orientation of a horizontal axis wind turbine is changed.

(c) *Conflicts of laws.* Local statutes, regulations, and ordinances that conflict with the requirements of this standard shall apply notwithstanding the requirements of this standard.

(d) *Performance.* The following SWECS performance characteristics shall be determined through atmospheric testing by the SWECS manufacturer or a separate testing organization designated by the SWECS manufacturer. If the SWECS manufacturer modifies the SWECS model in a way which significantly impacts the performance of the SWECS, the new model shall be tested in accordance with the requirements of paragraph (j)(1) of this standard.

(1) Power Output Curve. The SWECS power output shall be defined as a function of wind speed at the center of the SWECS rotor for wind speeds up to 15 meters per second (33.6 miles per hour) or the SWECS cutout speed, if achieved during the atmospheric test. The SWECS power output curve shall be derived from discrete wind speed and corresponding SWECS power output data using the method of bins as described in the Sandid Laboratory report referenced in Appendix II to this Part. The power output curve for an interconnected SWECS shall be determined using the required power conditioning SWECS subsystem as specified by the SWECS manufacturer.

(2) Standard Mean Power Output, Standard Operating Time Factor and Standard Annual Energy Production. Using the SWECS power output curve from paragraph (d)(1) of this section, the SWECS standard mean power output, standard power operating time factor, and standard annual energy production shall be computed for the designated annual average wind speeds of 3.6, 4.5.4, 6.3, 7.1 and 8.0 meters per second (8, 10, 12, 14, 15, and 18 miles per hour). The calculations shall be made in accordance with the following procedures:

(i) The frequency of occurrence [F(V)] for each designated average annual wind speed (V) shall be determined using ΔV of one unit (one meter per second or one mile per hour), and the Rayleigh distribution.

(ii) For each designated average annual wind speed (V), multiply the frequency of occurrence of each wind speed [F(V)] calculated in paragraph (d)(2)(i) of this section, by the power indicated at that wind speed (v) in the SWECS power output curve developed according to paragraph (d)(1) of this section.

(iii) The Standard Mean Power Output (kilowatts) for a designated average annual wind speed (V) shall be determined by the summation of the values calculated for each increment in paragraph (d)(2)(ii) of this section.

(iv) The Standard Annual Energy Production (kilowatt hours) for a designated average annual wind speed (V) shall be determined by multiplying the Standard Mean Power Output (kilowatts) calculated in paragraph (d)(2)(iii) of this section, by 8760 hours.

(v) The Standard Operating Time Factor at each designated average annual wind speed (V) shall be determined by:

(A) Adding those values of the frequency of occurrence calculated in paragraph (d)(2)(i) of this section, for all wind speeds where the power produced by the SWECS is zero; and

(B) Subtracting the sum of (A) above from one; and

(C) Multiplying the result of (B) above by 100.

(3) All reported test data involving SWECS power output shall be corrected to a standard air density of 1.2 kilograms per cubic meter, using the following equation:

$$P_s = \frac{1.2}{D_m} P_m$$

P_s = power output (kilowatts) corrected to a standard air density of 1.2 kilograms per cubic meter.

P_m = measured power output (kilowatts).

D_m = air density (kilograms per cubic meter) at the test site.

(4) Reference wind data shall be corrected to the center of the SWECS rotor height using the following equation:

$$V_r = V_m \left(\frac{Z_r}{Z_m}\right)^{1/7}$$

Where:

Vr=Corrected wind speed (meters per second or miles per hour) at Zr (meters or feet).

Vm=Measured wind speed (meters per second or miles per hour) at Zm (meters or feet).

Zr=Height (meters or feet) above ground level to the center of the SWECS rotor.

Zm=Height (meters or feet) above ground level where the referenced wind speed (Vm) (meters per second or miles per hour) was measured.

(e) *Safety.* (1) The SWECS manufacturer, or a testing organization designated by the SWECS manufacturer, shall document that the SWECS model has operated safely, without loss of structural and electrical integrity, in accordance with the requirements of paragraph (j)(1) of this section.

(2) The SWECS manufacturer shall demonstrate, through atmospheric testing, that the SWECS model has operated safely without loss of structural and electrical integrity under the following conditions:

(i) Loss of Electrical Load. Loss of user and/or utility electrical system load at wind speeds equal to or greater than that corresponding to maximum design SWECS power output; but not to exceed 118 meters per second (40 miles per hour) wind speed.

(ii) SWECS disconnect (and reconnect). A SWECS interconnected to a utility electrical system shall safely disconnect from that utility system when the utility electrical circuit to the SWECS is de-energized. The SWECS shall operate without damage to any subsystem of the SWECS, the electrical load, and or the utility system when the utility electrical system is re-energized after a disconnect.

(iii) Operation of the manual and/or normal shutdown subsystem.

(3) If a SWECS manufacturer modifies the SWECS model in a way which significantly impacts the safety of the SWECS, the new model shall be tested in accordance with the requirements of paragraph (j)(1) of this section.

(f) *Installation.* (1) Siting—the SWECS shall be installed according to the area and setback requirements of local codes governing wind energy devices. If existing local codes are not specific to the installation of a wind energy device, the SWECS shall be installed such that during operation, no part of the SWECS extends over a property line or utility easement, or infringes upon the local clearance requirements for an overhead utility line.

(2) *Manufacturer's instructions.* The SWECS manufacturer shall provide detailed installation instructions to the installer of the SWECS which shall, at a minimum include, the following:

(i) A standard foundation and anchor design or specifications, for normal soil conditions; and

(ii) A detailed parts list; and

(iii) Clearly written detailed instructions for the assembly, installation, checkout, operation, and maintenance of the SWECS at a typical site; and

(iv) Warning statements, placed on the first page of the documents, containing the following instructions or equivalent: Warning: Installation of This Product Near Powerlines is a Danger. For Your Safety, Follow the Installation Directions; and

(v) For an interconnected SWECS, information and instructions for interconnecting the SWECS to a utility company's electrical system, in a manner which meets the requirements specified in paragraph (f)(6) of this section.

(vi) Grounding and lightning procedures protection which follow the National Electrical Code articles 250 (Grounding) and 280 (Lightning Arresters). Where the design features of a particular SWECS require deviation from the NEC, the SWECS manufacturer shall specify grounding and lightning protection requirements and indicate where they deviate from the NEC.

(3) *Installers Responsibility.* (i) The SWECS shall be installed in accordance with the instructions provided by the SWECS manufacturer. The installation may deviate from the SWECS manufacturer's instructions under the following conditions:

(A) Where the onsite installation requires that procedures or components deviate from the SWECS manufacturer's standard written instructions or approved components list, the installer shall obtain prior written approval from the SWECS manufacturer specifying such deviations.

(B) Where the tower foundation and anchors require modifications from the standard design (or specifications) provided by the SWECS manufacturer, due to actual soil condition which are not considered normal and the installer has obtained from the SWECS manufacturer, his designated representative, or a registered professinal engineer, a foundation/anchor design (or specification) suitable for the characteristics at the site.

(ii) In the case of an interconnected SWECS, the installer or his designated representative shall, upon request, provide the local utility with installation procedures, and the performance and safety final test report of the SWECS to be installed.

(iii) The installer shall notify the State designated inspection authority of the installation within one day of completing the installation. A copy of the SWECS manufacturer's installation instructions, together with any appropriate written approval(s) of deviation from those instructions, shall be provided to the State designated inspection authority by the installer within four days of completion of the installation.

(4) *Local utility responsibility.* (i) The local utility shall be responsible for determining that all new as well as existing utility owned protection devices will ensure safe utility operation with an interconnected SWECS.

(ii) Should the local utility require specific electrical interconnection tests to be conducted on the SWECS prior to approval of the interconnection, the test requirements shall be specified by the utility.

(5) *General SWECS electrical requirements.* All SWECS electrical equipment and the method of connecting to the user electrical load shall be installed to conform to the following articles of the National Electric Code where applicable to SWECS requirements:

NEC Article and Title	
250	Grounding
280	Lightning Arrestors
300	Wiring Methods
310	Conductors for General Wiring
430	Motors
445	Generators

(6) *Interconnected SWECS electrical requirements.* In addition to the general SWECS electrical requirements in paragraph (f)(5) of this section, interconnected SWECS shall be installed to meet the following electrical requirements:

(i) The SWECS-to-utility electrical interconnection circuit shall incorporate a safe means to automatically and/or manually disconnect the SWECS electrically from the utility electrical system such that, in the event of a utility loss of power, an emergency, or servicing of the SWECS or the utility distribution system personnel are protected from hazardous electrical contact. The disconnects shall not interfere with reliability of service and the normal operation of circuit breakers, fuses, and other protective devices. The disconnect shall be lockable in the open-circuit position and access to the disconnect shall be available to the utility company at all times.

(ii) The National Electric Code (NEC) article 230 (services) shall apply, except where the local utility has specific requirements for the method of

interconnecting to their requirements for the method of interconnecting to their electrical system and which the local utility considers adequate in lieu of NEC article 230 (services).

(iii) The interconnection to the utility electrical/user load shall be electrically located on the user's side of the utility revenue meter.

(7) Electromagnetic interference (EMI) guidelines shall apply to any installed SWECS in accordance with Federal Communication Commission (FCC) Rules, 47 CFR Parts 15 (Subparts A and F), and 18 (Subparts A, D, and H).

(g) *Manufacturer reporting requirements—final test report.* As a minimum, the SWECS manufacturer or its designated testing organization shall document the results of the performance and safety tests specified in this standard in a final test report which meets the following requirements:

(1) *Final test report location.* A dated copy of the final test report shall be kept on file with the SWECS manufacturer and, if applicable, its designated testing organization, for a period of five years and shall be available to the public and the SWECS installer upon request at the manufacturer's cost of printing, handling, and mailing.

(2) *Test load description.* The type of load, size of load and method of load control used in testing shall be stated on the power/wind speed data sheet(s) which shall be documented in the test report.

(3) *Tested survival wind speed.* The maximum wind speed (meters per second and miles per hour) the SWECS has survived without loss of structural integrity under environmental test conditions shall be stated.

(4) *Type and location of instrumentation.* The type and location of the instrumentation used for testing shall be specified in the report.

(5) *Calibration of instrumentation.* The method of calibration used, the calibration time interval used, and the traceability of the calibration references to the National Bureau of Standards shall be documented.

(6) *Statement for tests other than atmospheric.* Documents showing test data and/or results developed from other than atmospheric tests shall be labeled as such and include the following statement or equivalent with only the appropriate terms, provided in the parenthesis, specified: The (data/results) presented were derived from (Towing/Wind Tunnel/Other-specify) tests and may reflect (higher/lower) (performance/safety) information than similar data derived from atmospheric tests due to the absence of significant wind turbulence, gusts, and direction changes.

(7) *Statement of yaw motion restriction for horizontal axis SWECS.* Documents showing test data and/or results which were derived from tests where the yaw motion of the SWECS was restricted, shall include the following statement or equivalent with the appropriate terms, provided in the parenthesis, and the number of degrees of yaw restriction shall be specified: The (data/results) were derived from tests where the yaw motion of the SWECS was restricted to ± (to be specified) degrees, and may reflect (higher/lower) (performance/safety) information than similar data derived from tests where full yaw motion was allowed.

(8) *Test results.* Results from the SWECS performance and safety testing accomplished to satisfy these criteria shall be available as a separate document from the final test report. These results shall be available to the public at the SWECS manufacturer's cost of printing, handling and mailing.

(h) *Utility reporting requirements for specific electrical interconnection tests—final test reports.*

(1) The local utility shall document any specific electrical interconnection test(s) it requires, prior to approving or disapproving the SWECS interconnection, in a final test report.

(2) A copy of the final test report shall be kept on file with the local utility for period of five years and shall be available for public inspection. One copy of the report shall be sent to the SWECS manufacturer, the SWECS installer, and the State designated inspection authority.

(3) The final test report shall include but not be limited to the following:

(i) Name and address of testing organization or person;

(ii) SWECS model and serial number;

(iii) Date of test;

(iv) Test requirements;

(v) Test methods used;

(vi) Instrumentation used;

(vii) Calibration requirements;

(viii) Data reduction methods used;

(ix) Data analysis and results;

(x) Recommendations and rationale;

(xi) Actions required and justification

(i) *Labeling requirements.* (1) Prominently displayed hazard warnings shall be permanently attached to all equipment which could present an electrical hazard.

(2) At a minimum, the following information shall be provided in labels attached to the SWECS housing in a visible, easily accessible location (standard international metric units will be used followed by English units in parenthesis, for all units of measure):

(i) Maximum design SWECS power output (KW) and the wind speed at which it is achieved (meters per second and miles per hour);

(ii) Nominal voltage (volts) and maximum current (amperes);

(iii) Equipment weight (kilograms and pounds) above the foundation. Tower weight shall be included in the total if the tower is installed simultaneously with wind turbine generator;

(iv) Survival wind speed (meters per second and miles per hour);

(v) SWECS manufacturer's name and address;

(vi) SWECS model number;

(vii) SWECS serial number; and

(viii) The following statement or equivalent Warning: Installation and Maintenance of This Product Near Power Lines is a Danger. For Your Safety Follow the Installation and Maintenance Instructions.

(3) The following information shall be provided on labels attached to the SWECS tower subsystem in a visible, easily accessible location.

(i) Equipment weight of the tower subsystem,

(ii) Manufacturer's name and address;

(iii) Model number;

(iv) Serial number; and

(v) The following tower warning label or equivalent Warning: Installation and Maintence of this Product Near Power Lines is a Danger. For Your Safety Follow the Installation and Maintenance Instructions.

(4) The following information shall be provided on labels attached to the SWECS power conditioning subsystem in a visible, easily accessible location.

(i) maximum power input (KW), rated voltage (volts) and rated current (amperes) of the power conditioning subsystem;

(ii) Manufacturer's name and address;

(iii) Model number; and

(iv) Serial number.

(5) The warning and information required in paragraphs (i)(1) and (2) of this section, as well as emergency and normal shutdown procedures, shall be provided on a label or labels easily read from ground level or located on the SWECS control panel.

(j) *Test Methods.* Data on the SWECS performance and safety characteristics as required in this standard, shall be obtained by atmospheric testing. Data to validate changes in the SWECS model design, which do not significantly impact the performance or safety of the SWECS, may be obtained by using the test methods as specified in (1)(2), or (3) below. Data to validate changes which do significantly affect performance and/or safety of the SWECS shall be

obtained only by the test method specified in (1) below.

(1) *Atmospheric test.* When an atmospheric test is used, the following requirements shall apply:

(i) Test. The atmospheric test shall be conducted for a period of time sufficient to provide not less than 25% of the SWECS Standard Annual Energy Production at 6.3 meters per second (14.0 miles per hour). The test period shall not be less than three months.

(ii) For both horizontal and vertical axis wind turbines, the SWECS rotor shall be located on a tower or support such that the minimum blade clearance above ground level is 2.5 meters (8.1 feet).

(iii) Any obstructions to the flow of air into or from the SWECS rotor which are not an integral part of the SWECS and have a total projected frontal area exceeding 25 percent of the rotor-swept area shall not be permitted within a distance of 5 rotor diameters (of the SWECS being tested) in any direction of the SWECS rotor.

(iv) SWECS which are designed for interconnection shall be tested utilizing a utility system as the electric load.

(2) *Towing Tests.* When a towing test is used to validate a change in SWECS model configuration, the following requirement shall apply:

(i) The anemometer location shall be such that the wind speed at the anemometer shall be within + 1 meter per second of the wind speed at the center of the SWECS rotor.

(ii) Any obstructions to the flow of air into or from the SWECS rotor which are not an integral part of the SWECS and have a total projected frontal area exceeding 25 percent of the rotor-swept area shall not be permitted within the clyinder of projection of the SWECS rotor.

(3) *Wind Tunnel Tests.* If a wind tunnel test is used to verify a SWECS model design change, the following requirements shall apply:

(i) The SWECS rotor shall be located at the center of the cross-section area of the wind tunnel test section; and

(ii) The SWECS rotorswept area shall not exceed 30 percent of the free stream cross-section area of the wind tunnels test section.

(4) *Yaw motion requirement for horizonal axis SWECS.* During the conduct of the tests described in paragraph (j) (1) through (3) of this section, the SWECS shall be free to operate in its normal configuration in yaw for all yaw motions ±90 degrees from the nominal wind direction wherever possible. If physcial limitations of the test setup make this impossible or unsafe, a physical limitation on the amount of yaw motion is permitted.

(5) *Data analysis requirements.* Performance testing shall be conducted over a range of wind speeds including, but not limited to, the range specified in paragraph (d)(1) (Power Output Curve). The bin width shall not be greater than 1.0 meters per second (2.2 miles per hour). The wind duration at each bin in the interval must satisfy at least one of the following conditions:

(i) The wind speed must be recorded in the given bin for a duration not less than 5 percent of the total test duration; or

(ii) The wind speed must be observed in the given bin for at least one minute; or

(iii) The wind speed in the given bin must have been recorded for at least 100 independent observations.

(6) Instrumentation. The instrumentation used to conduct the tests specified in this section shall meet the following requirements:

(i) The anemometer system used to measure wind speed shall have an error no greater than ±10 percent of the reading over the range 2 to 20 meters per second (4.5 to 45 miles per hour) and an anemometer distance constant equal to or less than 5 meters (16 feet).

(ii) Power output of the SWECS shall be measured or calculated from measured values with an error no greater than ±5 percent.

(iii) All readout or recording devices shall have an error no greater than ±5 percent of reading, a frequency response of at least 0.1 Hertz and shall be capable of recording or displaying essentially simultaneous wind speed and power output data.

(iv) The anemometer shall be located not less than one and not more than 10 SWEC rotor diameters from the center of the SWECS rotor if the anemometer is not located at or near the height of the center of the SWECS rotor (±1.5 rotor radii). The anemometer shall be located not less than 3 and no more than 10 SWECS rotor diameters from the center of the SWECS rotor if the anemometer is at or near the height of the center of the SWECS rotor (±1.5 rotor radii) and in no case shall tests be performed when the anemometer is located downwind from the rotor (when the wind direction is within ±45 degrees of line drawn from center of the rotor to the anemometer). All wind speed values must be corrected to the height at the center of the SWECS rotor using the locally measured wind shear profile or, if wind shear measurements are not available, the data shall be corrected using the following equation:

$$V_r = V_m \left(\frac{Z_r}{Z_m}\right)^{1/7}$$

Where:

Vr=Corrected wind speed (meters per second or miles per hour) at Zr (meters or feet).

Vm=Measured wind speed (meters per second or miles per hour) at Zm (meters or feet).

Zr=Height (meters or feet) above ground level to the center of the SWECS rotor.

Zm=Height (meters or feet) above ground level where the reference wind speed (Vm) (meters per second or miles per hour) was measured.

(v) Electrical power instrumentation shall measure the power delivered from the SWECS, minus any power used by the SWECS for such components as control subsystems and power conditioning equipment.

(vi) All working instruments used in the conduct of these tests shall be calibrated (per the instrument manufacturer's recommendations) to reference standards which are traceable to the National Bureau of Standards. The calibration may be accomplished by the instrument manufacturer or any other organization which has appropriate experience and equipment to accomplish the calibration process. Further, during the conduct of any required tests, the instruments being used shall have been calibrated within the designated calibration time interval recommended by the instrumentation manufacturer.

(7) *Testing organization certification.* The organization conducting any test outlined in this standard shall self-certify that it has met all the testing requirements stated in this standard. A signed statement of compliance with this standard shall be kept on file with the SWECS manufacturer and the organization that conducted the test for a period of 5 years.

§ 456.706 [Deleted]

4. 10 CFR Part 456 is amended by deleting § 456.706.

5. 10 CFR 456.812 is amended by adding paragraph (e) to read as follows:

§ 456.812 Standards for caulks and sealants, water heater insulation, heating/air-conditioning duct insulation and pipe insulation.

* * * * *

(e) Material standard for pipe insulation. Pipe insulation shall conform to:

(1) Federal Specification HH–I–558B Federal Specification for Mineral Fiber Batts and Blankets—Industrial Type; or

(2) Federal Specification HH–I–573B, Organic Cellular Flexible Unicellular Pipe Covering.

In addition, pipe insulation in its end-use configuration shall have a flame spread of no more than 150 when tested in accordance with ASTM E–84.

8. 10 CFR § 456.814 is amended by adding paragraph (f) and (g) to read as follows:

§ 456.814 Standards for furnace efficiency modifications.

* * * * *

(f) *Interim material standard for automatic intermittent pilot ignition systems (IID's) for gas-fired heating systems.* (1) All IID's shall conform to "Proposed American National Standard for Automatic Intermittent Pilot Ignition Systems for Field Installation" dated October 1979.

(2) All IID's shall contain a label stating: "This device should be installed only by an approved contractor."

(3) Manufacturers of IID's shall provide to all persons approved for installing the device interconnection or wiring diagrams which match the wiring configuration found on the applicance on which the IID is to be installed.

(g) *Material standard for vent dampers for gas-fired systems.*

* * * * *

(3) Wiring diagrams and instructions.

(i) Manufacturers of electrical automatic vent dampers and thermal vent dampers having electrical connections shall provide to all persons approved for installing the device an interconnection or wiring diagram(s) which is representative of the wiring configuration found on the appliance on which the damper is to be installed.

(ii) Manufacturers of mechanical automatic vent dampers shall provide to all persons approved for installing the device, an interconnection diagram which is representative of the piping configuration found on the appliance on which the damper is to be installed.

(iii) A verification-of-installation card to be returned to the manufacturer by the installer. The following information shall be requested on the card:

(A) Name of Installer.

(B) Name of Installer's Company.

(C) Name and Address of Purchaser.

(D) Model and Type of Device Installed.

(E) Date of Installation.

8. 10 CFR 456.905(d)(1) is amended by adding subparagraph (ii) to read as follows:

§ 456.905 Standard practice for the installation of loose fill insulation.

* * * * *

(d) *Installation Procedures.*

(1) *General*

* * * * *

(ii) Structural damage can be caused by excessive pressures during the installation or can result from installing insulation in constructions too weak to support the imposed load. Install insulation only so as not to cause any of the following conditions:

(A) Separation of finish materials from joists or studs;

(B) Cracking of materials or opening of joints between boards;

(C) Deflection of more than 1/200 of the joist or stud spacing.

9. 10 CFR Part 456 is amended by adding § 456.914 to read as follows:

§ 456.914 Standard practice for the field installation of electrically-operated, mechanically-actuated and thermally-actuated automatic vent dampers for use with existing gas-fired central furnaces and low-pressure hot-water boilers.

(a) *Scope.* (1) This practice is intended to achieve a safe installation of electrically-operated, mechanically-actuated, or thermally-actuated, automatic vent dampers on existing gas-fired central furnaces and low-pressure hot water boilers hereinafter referred to as "the heating appliances" or as simply "the appliances." A safe installation requires knowledge and equipment that may be possessed only by qualified installers. (A qualified installer is a person who has specialized training and a working knowledge of the applicable codes and regulations, tools, equipment, and methods necessary for the safe installation of automatic vent dampers for gas-fired appliances and the necessary understanding of the fundamentals of gas-fired heating systems (see § 456.314)). *An improper installation could result in injury or death from the venting of exhaust gases, including carbon monoxide, into the residence.* Electrical shock to the installer could also result. This practice outlines the procedure to be followed. No procedure can anticipate all situations. Accordingly, in some cases deviation from this procedure may be necessary for a safe installation. For this reason, *only qualified installers shall perform the installation.*

(2) A safe installation requires that safe vent damper and heating appliance designs be used. Therefore, the vent damper and heating appliance designs must, as a minimum, be listed by a nationally recognized testing laboratory and must meet State and local codes and the appropriate nationally recognized standards. These standards are ANSI Z21.66–1977, American National Standard for Electrically-Operated Automatic Vent Dampers Devices for Use with Gas-Fired Appliances; ANSI Z21.67–1978, American National Standard for Mechanically-Actuated Automatic Vent Damper Devices for Use with Gas-Fired Appliances; ANSI Z21.68–1978, American National Standard for Thermally-Actuated Automatic Vent Damper Devices for Use with Gas-Fired Appliances; ANSI Z21.13–1977, American National Standard for Gas-Fired Low Pressure Steam and Hot Water Boilers; ANSI Z21.47–1978, American National Standard for Gas-Fired Gravity and Forced Air Central Furnaces.

Note.—Often the authority having jurisdiction over the installation of gas equipment in a locality will have requirements that must be met before equipment is considered safe and is approved for use in that locality. Often equipment must be listed before it is approved. Listed equipment is that included in a list published by a nationally recognized testing laboratory that maintains periodic inspection of the production of equipment that it lists. Each listing states that the equipment either meets nationally recognized standards or has been tested and found suitable for use in a specified manner. Listed vent dampers and heating appliances are intended to include only safe designs. Using a listed vent damper on a listed heating appliance does not necessarily imply a safe retrofitted system, however. Not all listed vent dampers are compatible with all listed heating appliances. In addition, the safety of a retrofitted system depends not only on the safe designs of the existing heating appliance and vent damper but also on the manner in which the vent damper is installed.

(3) The installer shall ensure that mechanically-actuated vent dampers are only installed on appliances with which they are compatible. Compatibility is to be determined by comparing the appliance as found with diagrams furnished by the damper manufacturer showing interconnections among the heating appliance, the damper, the motive force and the control circuits. Electrically-operated vent dampers and thermal vent dampers with electrical connections shall only be installed on appliances where the wiring diagrams supplied by the vent damper manufacturer show the device to be compatible with the appliance. If a wiring or interconnection diagram is not

supplied by the vent damper manufacturer which duplicates the heating system on which the installation is desired, the installation must not be attempted.

(4) This practice is intended only for use with individual, automatically operated, natural gas-fired, hot-air (forced or gravity) furnaces and gas-fired low-pressure, hot water boilers equipped with draft hoods.

(5) Because vent dampers save energy by reducing the flow of heated air up the vent during periods when the main burner of the heating appliance is off, do not install vent dampers in areas that are essentially at outdoor temperatures, such as unheated attics, crawl spaces, or basements with openings directly to the outdoors.

(6) Because vent capacities are reduced when the difference between indoor and outdoor temperatures are the least, and, generally, when wind velocities are low, it is desirable that all checks of venting capacity or draft hood spillage be conducted when the outside temperature is above 65°F and the wind velocity is less than 10 mph. Venting may be particularly dependent on wind conditions in certain special situations. Extra caution must be exercised in these special situations that include exposed locations in high wind areas; locations in very hilly terrain; difficult constructional features for venting purposes, such as high pitched roofs; and neighborhoods with sharply varying building heights. In these situations, wind currents directed at the top of the chimney may cause downdrafts at times. If any of these situations are suspected of causing draft problems, it will be necessary to conduct the vent capacity or draft hood spillage checks on several days under various wind conditions.

(7) At any point, if it is determined that there is a condition that could result in unsafe operation of the heating system, the appliance must be shut off, the owner and the authority having jurisdiction informed of the required repairs, and the repairs made before continuing with the installation.

(8) This practice requires the following items be followed in order:

(i) Pre-Installation Procedure in paragraph (b) of this section;

(ii) General Installation Procedure in paragraph (c) of this section;

(iii) Post-Installation Procedure in paragraph (d) of this section.

(b) *Pre-Installation Procedure.* (1) This pre-installation procedure is to determine whether a gas heating appliance is properly installed and is in a safe condition for continuing use. Perform this procedure before making any attempt to install a vent damper, and do not install a vent damper on an appliance if the determinations required below cannot be made.

(2) Determine with suitable instruments, that there is no detectible concentration of combustible gas and/or carbon monoxide in the vicinity of the heating appliance. The absence of combustible gas is indicated by a reading less than 20 percent of the lower explosive limit on the appropriate instrument or by a smell test indicating complete freedom from odor of odorized natural gas. (The lower limit for detecting fuel gas by smell is approximately 20 percent of the lower explosive limit). The absence of CO is indicated by a reading of less than 50 ppm which is the lowest marking on several CO test instruments in common use.

(3) Determine that the heating system installation meets the requirements of all applicable codes and regulations. The heating system installation should at least meet the requirements of the American National Standard Fuel Gas Code, ANSI Z223.1–1974 (NFPA No. 54–1974) Part 1, Installation of Gas Piping and Gas Equipment on Nonindustrial Premises.

(4) Conduct a gas leakage test of the appliance piping and control system downstream of the shut-off valve in the supply line to the appliance. *Do not* use a flame or other source of ignition to check for gas leaks.

(5) Inspect the venting system to determine that the cross-sectional area of the vent connector is not less than the area of the draft hood outlet (the chimney side of the draft hood) and that the area of the vent is not less than the area of the largest, connected, draft hood outlet plus 50 percent of the areas of additional connected, draft hood outlets. If these criteria are not met, the vent system must be in accordance with the National Fuel Gas Code (ANSI Z223.1–1974) paragraphs 1.5.6.3 and 1.5.8.3. Determine that there are no manually adjustable dampers in the vent system. Also visually inspect for positive horizontal pitch (not less than ¼-inch/foot). Determine through an inspection of the entire interior of the vent system that there is no blockage, restriction, leakage, corrosion, etc., which could cause an unsafe condition. If this inspection is not performed, an outdoor temperature above 65°F and a wind velocity of less than 10 mph are mandatory during all tests for venting capacity or draft hood spillage.

(6) Determine that the outside termination of the vent is satisfactory (see National Fuel Gas Code, ANSI Z223.1–1974, 1.5.5.2 and 1.5.6.3). Determine that the chimney is in good condition, and is either a lined masonry chimney or an approved Type B or Type L vent or a factory-built chimney. Do not install a vent damper in a heating system using any other chimney type, including unlined masonry chimneys and uninsulated, single-wall metal pipes. Determine that the vent connector does not project into the chimney.

(7) Determine that the comfort thermostat(s) is in satisfactory operating condition. Check for excessive dust, corrosion, pitted contacts, and cracked or broken base or housing. Note the comfort thermostat setting so it can be reset after the installation is completed. Then adjust the thermostat for continuous operation. Determine that the burner input is in accordance with the heating appliance manufacturer's instructions.

(8) Visually determine that the main burner gas is burning properly and that there is no floating, lifting, or flashback. Adjust the primary air shutter(s) as required. If the appliance is equipped with flame modulation, check for proper main burner operation at low and high flame. Observe burning for evidence of plugged burners, improper flame alignment, combustion product leakage, and improperly adjusted pilot lights.

(9) Shut off all gas to the appliance using the shut-off valve in the supply line to the appliance. Shut off the main burners of all other appliances located within the same room or connected to the same vent. Note the settings of any thermostats that are to be changed so they can be reset after the installation is completed.

(10) Determine that there is sufficient combustion air. In unconfined spaces in buildings of conventional frame or masonry construction, infiltration normally is adequate to provide air for combustion, ventilation, and dilution of flue gases. If the unconfined space is within a building of unusually tight construction, air must be obtained from outdoors or from spaces freely connected with outdoors. Permanent openings having a total free area of not less than one square inch per 5,000 Btu/hr of total input rating of all appliances must be provided. For appliances located within confined areas, follow the recommendations of the National Fuel Gas Code (ANSI Z223.1–1974) paragraphs 1.3.4.3 through 1.3.4.6. Check any ducts for obstructions and other unsafe conditions.

(11) Shut off electricity to the heating appliance. Determine that all electrical wiring at the appliance has no loose connections, charred insulation, cracked or worn insulation, and potential shorting to ground. Determine that fuses

and circuit breakers are of correct size and that wires are of correct size for the appliance. Turn electricity back on.

(12) Determine that all appliance burners and gas manifolds are not blocked or corroded. Determine that the burner is properly aligned and shows no evidence of burner misalignment and in particular no evidence of hot spots on the heat exchanger.

(13) *Applicable only to furnaces:* Determine that the heat exchanger has no cracks, openings, leakage deposits, excessive corrosion, and/or evidence of excessively hot spots. Determine that the recirculating air section of the appliance has no flammable materials or materials that could emit toxic fumes on being heated.

(14) *Applicable only to boilers:* Determine that there is no evidence of water or combustion product leaks.

(15) Insofar as is practicable, close all building outside doors and windows. Turn on all exhaust fans (range hood, bathroom exhausts, etc.) so they will operate at maximum speed. Turn on any clothes dryers vented to the outside. Do not operate summer exhaust fans. Make certain that any fireplace(s) is not operating. Close fireplace dampers.

(16) For the following vent system checks, the worst venting conditions that may reasonably exist should be duplicated. The worst venting conditions exist when the space occupied by the heating appliance is at the lowest pressure. If there are exhaust fans in the same room as the heating appliance or if there are no exhaust fans in the residence, the lowest pressure will probably occur when the doors to other spaces of the building are closed. If there are exhaust fans in other rooms, the pressure will probably be lowest when doors connecting these rooms with the heating appliance space are open. Based on these considerations, open or close doors to other spaces of the building as required to produce the lowest pressure in the space occupied by the heating appliance. If it is not known which condition results in the lowest pressure, perform paragraphs 16 through 20 twice—once with doors to other spaces of the building open and once with the doors closed. After the appliances have been off for at least 30 minutes, turn on the gas to the appliance being inspected and place it in operation. *Follow the appliance manufacturer's lighting instructions.* Adjust the comfort thermostat for continuous, full-burner appliance operation.

(17) Test for spillage at the draft hood relief opening at 2 minutes of main burner operation. This short time is necessary if the test is to simulate a reasonably severe condition. Use a device that will produce unpressurized flame or smoke, such as a match flame or cigarette smoke. Considerable care must be used to determine if flow is in or out of the draft hood Adequate lighting must be provided for observation and the flow through all areas of the draft hood opening(s) must be carefully observed. After testing for spillage at the heating appliance draft hood, also test for spillage at other draft hoods connected to the same vent.

(18) Shut off the main burner and let the appliance cool for at least 15 minutes.

(19) Turn on all other fuel-burning appliances that are within the same room or that are connected to the same vent so they will operate at their full inputs. Turn on the appliance being inspected so that it will operate at its full rated input.

(20) Repeat paragraph (17).

(21) At 5 minutes of main burner operation, measure the flue gas temperature and carbon monoxide (CO) concentration at a point one inch before the inlet to the draft hood at the center of the flue passage(s). This temperature should be at least 200°F. This temperature is necessary to limit condensation within the vent. This temperature should also be less than 550°F, the vent damper maximum design temperature. The maximum carbon monoxide concentration should be 0.04 percent (400 ppm), as permitted for new heating appliances. If the heating appliance is equipped with flame modulation, rerun the minimum (200°F) flue gas temperature test and the CO test at the lowest flame conditions.

(i) *For installation of thermally-actuated vent dampers only:* Measure the temperature at the center of the vent connector six inches after the outlet of the draft hood. The vent gas temperature must be at least 370°F but less than 550°F. The damper design has been tested for flow restriction at 370°F.

(ii) *For installation of electrically-operated or mechanically-actuated vent dampers only:* If the vent damper is not installed with a redundant gas valve, it must be equipped with a damper-closing temperature control, and the temperature at the center of the vent connector six inches after the outlet of draft hood must be measured. This damper-closing temperature control is intended to keep the damper open whenever the main burner is operating even if there is a malfunction and the comfort thermostat is not calling for heat. The vent gas temperature must be more than 375°F under normal conditions to ensure that the damper-closing temperature control will function properly (i.e., keep the damper open) under an abnormal condition of restricted fuel gas input. If the vent gas temperature at full output is not above 375°F, do not install a vent damper with a damper-closing temperature control.

(22) Return doors, windows, exhaust fans, fireplace dampers, and other appliances to their previous conditions of use.

(23) Determine that the pilot(s) is burning properly and that main burner ignition is satisfactory by turning the main power supply switch for the heating appliance off and on. Test the pilot safety device to determine if it is operating properly by extinguishing the pilot burner(s) when the main burner is off and determine that the main gas valve does not open upon a call for heat beyond the safety shut off time specified by the automatic gas ignition device manufacturer. If this time is not known, a safety shut off time of one minute must be met. Relight the pilot(s) after this time check.

(24) *Applicable only to furnaces:* Check both the limit control and the fan control to determine that they operate within the heating appliance manufacturer's specifications.

(25) *Applicable only to hot water boilers:* Test low-water cutoffs, automatic-feed controls, high-pressure limit controls, high-temperature-limit controls, relief valves, water pumps, and the circulating system to determine that they are operating within the manufacturer's specifications.

(c) *General Installation Procedure.*

(1) The general installation procedure is to be used in conjunction with installation instruction supplied by the automatic vent damper manufacturer to aid in safely installing a vent damper on an existing appliance. At any point, if it is determined that there is a condition that could result in unsafe operation of the heating system, the appliance must be shut off, the owner and authority having jurisdiction informed of the necessary repairs, and the repairs made before continuing with the installation.

(2) Ensure that the damper manufacturer has supplied an interconnection or wiring diagram which matches the wiring configuration found on the appliance on which the damper is to be installed. Determine that the heating system and vent damper are listed and approved models. Ensure that the damper and other materials are in good condition and free of damage resulting from shipping or other causes and ensure that all parts are included. Determine if the vent damper includes a damper-closing temperature control. On any damper with electrical connections ensure that the required voltage of the

damper is compatible with the voltage of the control circuit of the heating appliance. Determine that the heating appliance automatic gas valve does not have a manual override feature which would permit operation of the heating appliance while the damper is in the closed position or while any damper safety system is not operational. If a valve with such an override feature is found, the manual override feature must be removed or the valve replaced before proceeding with installation of the damper.

For installation of mechanically-actuated vent dampers only: Determine that the range of available motive force (gas pressure, water pressure, etc.) is within the vent damper manufacturer's specified operating range.

(3) Shut off all gas and electricity to the heating appliance. To shut off the gas, use the shut-off valve in the supply line to the appliance. To shut off the electricity, use the main power switch for the heating appliance.

(4) Install the automatic vent damper in strict accordance with the manufacturer's installation instructions. Make certain that the damper is located in the portion of the venting system that serves only the appliance on which the damper is being installed and that the damper is between the appliance draft hood and the first branch (if any) in the vent system. The vent damper must be installed *after* the draft hood, that is, between the draft hood and the chimney. If the damper is equipped with a damper-closing temperature control or is a thermal damper, the damper must be located within three diameters of the draft hood. The inlet size of the vent damper must not be less than the outlet size of the draft hood. *Do not add any components (such as relays) not specified by the vent damper manufacturer.*

(5) Determine that the vent system is adequately supported to hold the additional weight of the vent damper without sagging. This may require band iron straps attached overhead and/or self-tapping screws and at each joint. Visually inspect the modified venting system for proper horizontal pitch (not less than ¼-inch/foot).

(6) *For installation of electrically-operated or mechanically-actuated vent dampers only:* If the vent damper is not equipped with a damper-closing temperature control, an additional approved automatic gas valve must be installed in accordance with the vent damper manufacturer's installation instructions. This gas valve is intended to shut off gas flow if the other gas valve should fail to close completely. It may be either an additional valve (without pilot features) located in the gas line between the existing valve and the main burner or a replacement valve that includes two main gas valves within a single unit. Follow the vent damper manufacturer's instructions. After installing a new gas valve, purge air from the affected gas lines and conduct a gas leakage test of the appliance piping and control system downstream of the shut-off valve in the supply line to the appliance.

(7) Make sure electrical connections are tight and wires are clear of high-temperature locations and properly supported. Route wires to minimize the possibility of their being damaged. All wiring must meet the requirements of all applicable codes and regulations. As a minimum, wiring must meet the requirements of the National Electrical Code, NFPA 70–1975.

(d) *Post-Installation Procedure.* (1) This post-installation procedure is to determine that the automatic vent damper is properly installed and that the retrofitted system is in a safe condition for use. At any point, if it is determined that there is a condition that could result in unsafe operation of the heating system, the appliance must be shut off, the owner and authority having jurisdiction informed of the necessary repairs, and the repairs made before continuing.

(2) Turn on electrical power to the heating appliance.

(3) *For installation of electrically-operated or mechanically-actuated vent dampers only:* By operating the furnace burner through the control circuit, determine that the damper operates properly and is correctly sequenced with the heating appliance's operating controls. The damper should be nearly open before the automatic gas valve(s) opens and the damper should remain open while there is a call for main burner operation. The automatic gas valve(s) should close when the damper begins to close. The automatic gas valve(s) and the damper should remain closed when there is no call for heat. The damper must open and close freely without evidence of the interference or binding. Also determine that the automatic gas valve(s) and damper closes fully.

Note.—If a boiler automatic gas valve(s) is sequenced by an aquastat, determine that the damper has opened fully or is nearly open prior to the opening of gas valve(s).

(4) If the damper has electrical current requirements, determine the amperage draw of the all circuits served by the heating appliance transformer (including such items as thermostats, humidifiers, controls for electronic filters, the vent damper, etc.) Check the heating appliance transformer for adequate capacity. If the transformer does not have adequate capacity, it must be replaced.

(5) Check the setting of any heat anticipator in the comfort thermostat and readjust as necessary.

(6) Insofar as is practical, close all building outside doors and windows. Turn on any exhaust fans (range hood, bathroom exhausts, etc.) so they will operate at maximum speed. Turn on any clothes dryers vented to the outside. Do not operate summer exhaust fans. Make certain that any fireplace(s) is not operating. Close fireplace dampers.

(7)(i) *For installation of thermally-actuated vent dampers only:* For the following vent system checks, the worst venting conditions that may reasonably exist should be duplicated. The worst venting conditions exist when the space occupied by the heating appliance is at the lowest pressure. If there are exhaust fans in the same room as the heating appliance or if there are no exhaust fans in the residence, the lowest pressure will probably occur when the doors to other spaces of the building are closed. If there are exhaust fans in other rooms, the pressure will probably be lowest when doors connecting these rooms with the heating appliance space are open. Based on these considerations, open or close doors to other spaces of the building as required to produce the lowest pressure in the space occupied by the heating appliance. If it is not known which condition results in the lowest pressure, perform the work specified in paragraphs 6 through 8 of this document twice—once with doors to other spaces of the building open and once with the doors closed. After the appliances have been off for at least 30 minutes, turn on the gas to the appliance on which the damper has been installed and place the appliance in operation. *Follow the manufacturer's lighting instructions.* Adjust the comfort thermostat for continuous full burner appliance operation.

(ii) *For installation of electrically-operated and mechanically-actuated vent dampers only:* Turn on the gas to the heating appliance and place it in operation. *Follow the manufacturer's lighting instructions.* Adjust the comfort thermostat for continuous, full-burner operation.

(8) Test for spillage at the draft hood relief opening at 2 minutes of main burner operation. This short time is necessary to simulate a reasonably severe test. Use a device that will produce unpressurized flame or smoke, such as a match flame or cigarette smoke. Considerable care must be used

to determine if flow is in or out of the draft hood. Adequate lighting must be provided for observation and the flow through all areas of the draft hood opening(s) must be carefully observed.

(9) *For installation of thermally-actuated vent dampers only:* If the appliance is equipped with flame modulation, repeat paragraphs 6 and 7 at the lowest flame conditions.

(10) Visually determine that main burner gas is burning properly and that there is no floating, lifting, or flashback. If the appliance is equipped with flame modulation, determine that proper main burner operation at low and high flame is maintained.

(11) Determine that the pilot(s) is burning properly and the main burner ignition is satisfactory by turning the main power supply switch for the heating appliance off and on. Test the pilot safety device to determine that it is operating properly by extinguishing the pilot burner(s) when the main burner is off and determining that the main gas valve does not remain open upon a call for heat beyond the safety shut off time specified by the automatic gas ignition device manufacturer. If this time is not known, a safety shut off time no longer than 1 minute must be met. Relight the pilot(s) after this check.

(12)(i) *For installation of thermally-actuated vent dampers only:* Cycle the heating appliance through at least three normal operating cycles. The damper must open and close properly without evidence of interference or binding. Determine that the damper closes fully. The damper may not close immediately with the thermostat but after a period of time, it should close.

(ii) *For installation of electrically-operated and mechanically-actuated vent dampers only:* Cycle the heating appliance through at least three normal operating cycles. Determine that the damper is nearly fully open before the main burner gas flow begins and that the main burner gas flow stops as or before the damper begins to close. Damper must open and close freely without evidence of interference or binding. The damper must close fully. If the vent damper includes a damper-closing temperature control, the damper may not close immediately with the thermostat. Check this by operating the heating appliance for 10 minutes. Then lower the setting on the comfort thermostat to shut off the main burner gas flow. The damper should remain open for a period of time and then close. If the heating appliance is equipped with flame modulation and the vent damper includes a damper-closing temperature control, operate the heating appliance for 10 minutes at the lowest flame conditions. Then reduce the comfort thermostat to shut off the main burner gas flow. The damper should remian open for a period of time and then close.

(13) *Applicable only to furnaces:* If the furnace electrical circuit has been modified during vent damper installation, check both the limit control and the fan control to determine that they operate within the heating appliance manufacturer's specifications.

(14) *Applicable only to boilers:* If the boiler electrical circuit has been modified during vent damper installation, test low-water cutoffs, automatic-feed controls, high-temperature-limit controls, water pumps, and the circulating system to determine that they are operating within manufacturer's specifications.

(15) *For installation of thermally-actuated vent dampers only:* Return doors, windows, exhaust fans, fireplace dampers, other appliances, and comfort thermostat(s) to their previous conditions of use.

(16) Fill in the label on the damper with the name and address of the installing company, the name of the individual installer, and the date of the installation.

(17) Complete the verification-of-installation card supplied by the vent damper manufacturer pursuant to § 456.814 and return this promptly to the manufacturer.

(18) Leave the vent damper manufacturer's instructions in a conspicuous location near the heating appliance and advise the resident to read these instructions especially for observations to be performed by the resident.

(19) As required by codes and regulations, notify the appropriate authority that the installation has been completed and turn off the heating appliance until any required inspection is completed.

10. 10 CFR Part 456 is amended by adding § 456.915 to read as follows:

§ 456.915 Interim standard practice for the installation of automatic intermittent pilot ignition devices (IID's).

(a) *Scope.* This practice provides minimum requirements for the installation if IID's for gas-fired furnaces.

(b) *Requirements.* Installation shall meet the requirements of Proposed American National Standard for Automatic Intermittent Pilot Ignition Systems for Field Installation, October 1979 (see Appendix II (b)(1)(A) for availability).

11. 10 CFR Part 456 is amended by adding § 456.916 to read as follows:

§ 456.916 Standard practices for the installation of caulks and sealants.

(a) *Scope.*

(1) These practices apply to the on-site installation of caulks and sealants used to control rain water leakage and major air infiltration through building walls.

(2) These practices do not apply to the sealing of minor cracks at the building's exterior.

(b) *Material selection, joint preparation, and installation procedures.* The type of caulk or sealant chosen for a given application depends on the composition of the adjacent materials, temperature fluctuation, exposure to direct sunlight, width and depth of the crack or joint to be sealed and movement in the joint. Select caulks and sealants, prepare the joint and substrata, and install the material in conformance with the following standards and provisions:

(1) Putty and Oil and Resin Base Types: ASTM C–797–75, Standard Recommended Practices and Terminology for Use of Oil-and Resin-Based Putty and Glazing Compounds.

(2) Acrylic (Solvent Type) and Butyl Rubber: ASTM C–804–75, Standard Recommended Practices for Use of Solvent-Release Type Sealants.

(3) Latex Sealing Compounds: ASTM C–790–74, Standard Recommended Practices for Use of Latex Sealing Compounds.

(4) Chlorosulphonated Polyethylene, Polysulfide-Single Component, Polysulfide-Multi-Component, Polyurethane-Single Component, Polyurethane-Multi-Component and Silicone: Follow the provisions relating to application and use included in the applicable Federal Specifications (see Table 3, § 456.812).

12. 10 CFR Part 456 is amended by deleting Appendix II and replacing it with the following:

Appendix II Part 456—Standards Incorporated by Reference

(a) Incorporation by reference of material and installation standards. The material and installation standards identified herein are hereby incorporated by reference into this Part as though set forth in full herein, pursuant to 5 U.S.C. § 552(a).

Incorporation by reference of material and installation standards in 10 CFR Part 456 was approved by Director of the Federal Register, November 1, 1979 and September 17, 1980.

(b) Statement of availability.

(1) Copies of the standards set out in paragraph (d) of this Appendix may be obtained at the following addresses:

(A) American National Standards Institute (ANSI), 1430 Broadway, New York, New York 10018; except that the "Proposed American National Standard for Automatic Intermittent

Pilot Ignition Systems for Field Installations" may be obtained from Mr. F. G. Hammaker, Administrative Secretary, 721 American Materials Standard Committee, 8501 E. Pleasant Valley Road, Cleveland, Ohio 44131; (216) 524–4990.

(B) American Society of Testing and Materials (ASTM), 1910 Race Street, Philadelphia, PA 19103.

(C) National Fire Prevention Administration (NFPA), 470 Atlantic Avenue, Boston, MA 02210.

(D) Environmental Protection Agency (EPA), CERI–SB–53, Cincinnati, Ohio 45268.

(E) U.S. Department of Commerce, National Bureau of Standards (NBS), Washington, D.C. 20234.

(F) Federal Specification: Customers Service, Publication and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

(G) Building Officials and Code Administrators (BOCA), International Inc., 17926 S. Halsted Street, Chicago, IL 60430.

(H) Underwriter Laboratory (UL) Publication Stock, 333 Pfingston Road, Northbrook, IL 60612.

(I) Fir and Hemlock Door Association (FHDA), Yeon Building, Portland, OR 92704.

(J) Department of Housing and Urban Development (HUD), Office of Technical and Credit Standards, Room 6156, 451 Seventh Street, S.W., Washington, D.C. 20410.

(K) Sandia Laboratory, Environmental Research Division—5333, Albuquerque, NM 87185.

(L) Consumer Product Safety Commission (CPSC), 1750 K Street, N.W., Washington, D.C.

(M) National Woodwork Manufacturers Association (NWMA) 205 W. Toughy Avenue, Parkridge, IL 60068.

(2) Copies of all standards incorporated by reference are available for inspection in the DOE Reading Room, Room 5B–180, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C., between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday.

(c) Changes in material and installation standards. Any change to any material or installation standard will be made in accordance with statutory requirements for notice and public comment and with DOE policy for the adoption of rules. Notice of any proposed change will be published in the Federal Register and reflected as an amendment to the table in paragraph (d).

(d) Table of Standards incorporated by reference.

BILLING CODE 6450-01-M

Table of Standards

Number	Title	Date Approved	Section Reference	Address[1] Code
ANSI:				
ANSI/AAMA 1002.9-1977	"Voluntary Specification for Aluminum Combination Storm Windows for External Applications".	Nov. 1, 1979	§456.813.	A
ANSI/AAMA 1102.7-1977	"Voluntary Specifications for Aluminum Storm Doors"	"	§456.813.	A
ANSI/ASTM B 152-79	"Standard Specification for Cooper Sheet, Strip, Plate, and Rolled Bar".	Sept. 17, 1980	§456.810.	B
ANSI/ASTM B 446-75	"Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS06625) Rod and Bar".	"	§456.810	B
ANSI/ASTM D 2156-65 (1975)	"ANSI Standard Method of Tests for Smoke Density in the Flue Gases from Distillate Fuels".	Nov. 1, 1979	§456.913.	B
ANSI Z21.13-1977	"Gas-fired Low Pressure Steam Hot Water Heating Boilers"	"	§456.814. & §456.914.	A
ANSI Z21.20-1979	"ANSI Standard for Automatic Gas Ignition Systems and Components".	"	§456.814.	A
ANSI Z21.47-1978	"ANSI Standard for Gas-fired Central Furnaces"	"	§456.814. & §456.914.	A
ANSI Z21.59-1974	"Gas-fired High Pressure Steam and Hot Water Heating Boilers".	"	§456.814.	A
ANSI Z21.66-1978	"ANSI Standard for Elctrically-Operated Automatic Vent Damper Devices for Use with Gas-fired Applicances".	"	§456.814. & §456.914.	A
ANSI Z21.67-1978	"ANSI Standards for Mechanically-Actuated Automatic Vent Damper Devices for Use with Gas-fired Appliances".	"	§456.814. & §456.914.	A
ANSI Z21.68-1978	"ANSI Standard for Thermally-Actuated Automatic Vent Damper Devices for Use with Gas-fired Appliances".	"	§456.814. & §456.914.	A
ANSI Z91.2-1976	"Performance Requirements for Automatic Pressure Oil Burners of the Mechanical Draft Type".	"	§456.814. & §456.913.	A
ANSI Z96.1-1978/UL 727	"Oil-fired Central Furnaces"	"	§456.814.	A/H

[1] Corresponds to address noted above where copies of standards can be obtained.

Number	Title	Date Approved	Section Reference	Address Code
ANSI:				
ANSI Z96.2-1974/UL 296	"Oil Burners"	Nov. 1, 1979	§456.814.	A/H
ANSI Z96.3-1975/UL 726	"Oil-fired Boiler Assemblies"	"	§456.814.	A/H
ANSI/NWMA I.S. 2-73	"Industry Standard for Wood Windows"	"	§456.813.	M
ANSI/NWMA I.S. 5-73	"Ponderosa Pine Doors"	"	§456.813.	M
ASTM:				
ASTM C-177-76	"Standard Test Method for Steady State Thermal Transmission Properties by Means of the Guarded Hot Plate".	Sept. 17, 1980	§456.810.	B
ASTM C-236-66 (Reapproved 1971)	"Standard Test Method for Thermal Conductance and Transmittance of Built-up Sections by Means of the Guarded Hot Box".	"	§456.810.	B
ASTM C-516-75	"Standard Specification for Vermiculite Loose Fill"	Nov. 1, 1979	§456.806.	B
ASTM C-518-76	"Standard Test Method for Steady State Thermal Transmission Properties by the Means of Heat Flow Meter".	Sept. 17, 1980	§456.810.	B
ASTM C-520-65 (Reapproved 1975)	"Standard Method for Density of Granular Loose-fill Insulation"	Nov. 1, 1979	§456.806 & §456.807.	B
ASTM C-570-72	"Specification for Oil and Resin Based Caulking Compound for Building Contruction".	"	§456.812.	
ASTM C-578-69	"Standard Specification for Preformed, .Block-Type Cellular Polystyrene Thermal Insulation".	"	§456.808.	B
ASTM E-737-80	"Standard Practice for the Installation of Storm Windows, Replacement Windows, Multi-Glazing, Storm Doors and Replacement Doors".	Sept. 17, 1980	8456.911.	B
ASTM C-755-73	"Standard Recommended Practice for Selection for Vapor Barriers for Thermal Insulation".	Nov. 1, 1979	§456.	B
			§456.903.	B

Number	Title	Date Approved	Section Reference	Address Code
ASTM:				
ASTM C-790-74	"Standard Recommended Practices for Use of Latex Sealing Compounds".	Sept. 17, 1980 ~~Nov. 1, 1979~~	§456.916.	B
ASTM C-797-75	"Standard Recommended Practices and Termonology for Use of Oil- and Resin-Based Putty and Galzing Compunds".	"	§456.916.	B
ASTM C-804-75	"Standard Recommended Practices for Use of Solvent Release Type Sealants".	"	§456.916.	B
ASTM C-834-76	"Specification for Latex Sealing Compounds"	Nov. 1, 1979	§456.812.	B
ASTM D-257-78	"Test for DC resistance or Conductance of Insulating Materials".	Sept. 17, 1980	§456.810.	B
ASTM D-1622-63 (Reapproved 1975)	"Standard Method of Test for Apparent Density of Rigid Cellular Plastics".	"	§456.810.	B
ASTM E-84-79B	"Standard Test Method for Surface Burning Characteristics of Building Materials".	Nov. 1, 1979	§456.808. & §456.899; §456.810. & §456.812.	B
ASTM E-96-66 (Reapproved 1972)	"Standard Test Method for Water Vapor Transmission of Materials in Sheet Form".	"	§456.805.	B
ASTM E-119-79	"Standard Methods of Fire Tests of Building Construction and Materials".	"	§456.906. & §456.907.	B
ASTM E-136-79	"Test for Non-Combustibility of Elementary Materials"	"	§456.905. & §456.906.	B
ASTM E-283-73	"Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors".	"	§456.813.	B
ASTM E-576-76	"Standard Test Method for Dew/Frost Point of Sealed Insulating Glass Units in Vertical Position".	"	§456.813.	B
ASTM G-1-72 (Reapproved 1979)	"Standard Recommended Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens".	Sept. 17, 1980	§456.810.	B
BOCA:				
BOCA Research Report No. 72-23		Nov. 1, 1979	§456.813.	G

Number	Title	Date Approved	Section Reference	Address Code
EPA:				
EPA Report No. 600/2-75-069a.....	"Guidelines for Residential Oil Burner Adjustments".....	Nov. 1, 1979	§456.913.	D
Federal Specifications:				
HH-I-515D (6/78).....	"Insulation, Thermal (loose-fill for Pneumatic or Poured Application): Cellulosic or Wood Fiber".	"	§456.803; §446.804 &§456.805.	F
HH-I-524B (11/72 - Interim Amendment-, 1/76).....	"Insulation Board, Thermal (Polystyrene)".....	"	§456.808.	F
HH-I-530A (1971 and Interim Amendment 3, 5/76).....	"Insulation Board, Thermal (Polyurethane and Polyiscocynurate)"	"	§456.809.	F
HH-I-558B (1971 and Interim..... Amendment 3, 5/76)	"Insulation Blocks, Boards, Blankets, Felts, Sleeving, and Pipe Fitting Coverings".	"	§456.812.	F
HH-I-573B (1968 and Interim Amendment, 1976).....	"Insulation Thermal, (Flexible Unicellular Sheet and Pipe Covering)	Sept. 17, 1980	§456.812.	F
HH-I-574B (1974 and Interim Amendement 1, 9/76).....	"Insulation, Thermal (Perlite)".....	Nov. 1, 1979	§456.807.	F
HH-I-585C (1974 and Interim Amendment 1, 9/76).....	"Insulation, Thermal (Vermiculite)".....	"	§456.806.	F
HH-I-1030A (1973 and Interim..... Amendment 1, 9/76)	"Insulation, Thermal (Mineral Fiber for Pneumatic or Poured Application)".	"	§456.804. & §456.805.	F
HH-I-1252B (1976).....	"Insulation, Thermal Reflective (Aluminum Foil)"	"	§456.810.	F
TT-S-001543A (1971).....	"Sealing Compound, Silicone Rubber Base (for Caulking, Sealing, and Glazing in Buildings and Other Structures)."	"	§456.812.	F
TT-S-00227E (1969 and..... Amendment 3, 10/79)	"Sealing Compound, Elastomeric Type, Multi-Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures)".	"	§456.812.	F
TT-S-001657 (COM-NBS) (1970).....	"Sealing Compound, Single Component Butyl Rubber Base, Solvent Release Type (for Buildings and Other Types of Construction)".	"	§456.812.	F

Number	Title	Date Approved	Section Reference	Address Code
Federal Specifications:				
TT-S-00230C (COM-NBS) (1970 and Amendment 2, 10/70)	"Sealing Compound, Elastomeric Type, Single-Component, (for Caulking, Sealing, and Glazing in Buildings and Other Structures)".	Nov. 1, 1979		
TT-C-00598C (COM-NBS) (1970)	"Caulking Compound, Oil and Resin Type, (for Building Construction)".	"	§4 56.812.	F
TT-P-00791B (GSA-FSS) (1969 and Amendment 2, 1970)	"Putty Linseed-Oil Type, (for Wood-Sash-Glazing)"	"	§4 56.812.	F
FHDA: FHDA 6-79	"Industry Standard for Douglas Fir, Western Hemlock, and Sitka Spruce Doors and Blinds".	"	§4 56.812.	F
HUD: HUD Intermediate MPS Supplement 4930.2-1977	"Solar Heating and Domestic Hot Water Systems"	"	§4 56.813.	I
NBS: NBS/PS 26-70	"Rigid Polyvinyl-chloride Profile Extrusions"	"	§4 56.702; §4 56.703 & §4 56.704. §4 56.813.	J E
NFPA:				
NFPA-31-1978	"1978-National Fire Code," Standard for the Installation of Oil and Burning Equipment"	"	§4 56.905; §4 56.906; §4 56.907; §4 56.909; & §4 56.913.	C
NFPA-54/ANSI Z223.1-1-1974	"1978-National Fire Code" National Fuel Gas Code	"	§4 56.905; §4 56.906; §4 56.907; §4 56.909; & §4 56.914.	C/A
NFPA-70-1978	"National Electric Code," 1978	Sept. 17, 1980	§4 56.914. & §4 56.705.	C
NFPA-211-1977	"National File Code" Standard for Chimneys, Fireplaces, and Vents			
	"Install of Gas Piping and Gas Equipment on Non-Industrial Premises"	August, 1979	§4 56.905; §4 56.906; §4 56.907; §4 56.909; & §4 56.912.	C
Sandia Laboratories Report SAND 77-1375-1978	Performance Evaluation of Wind Energy Conversion Systems Using the Method of Bins".	~~Nov. 1, 1979~~ Sept. 17, 1980	§4 56.705.	K
UL: UL 599 3rd Ed.-1975, Amendments through 1978	"Standard for Heat Pumps"	October 1, 1979	§4 56.814.	H

[FR Doc. 80-29217 Filed 9-23-80; 8:45 am]

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